

Application Note No. LAN-074e

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Revision History:

Version	Changes	Date	Author
0	Pre-Release	18.04.2017	H. Schwär
1	Release	28.04.2017	H. Schwär
2	Reviewed	14.09.2017	M. Klahr
3	Register 0x0F : Overflow-Bit added	15.11.2017	H. Schwär
4	Register 0x07: Filter added	23.02.2018	A. Pitsch

phyCAM VM-050 / VM-051 Register Reference

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1 Introduction

Various registers are embedded to control the camera module and read status information. The I²C bus master can address the camera module VM-050 or VM-051 via read/write access to these registers.

The I²C register addresses of the VM-050 or VM-051 are 8-bit wide. The content of each register is 16-bit value.

I²C address options of the VM-050 / VM-051 camera modules:

Device	I ² C-Address	Configuration			
		CAM_CTRL1	J5	J4	J2
VM-050 VM-051	0x94	GND	1+2	2+4	1+2
		x	x	2+3	1+2
	0x9C	VCAM	1+2	2+4	1+2
		x	x	1+2	1+2
	0xB4	GND	1+2	2+4	2+3
		x	x	2+3	2+3
	0xBC	VCAM	1+2	2+4	2+3
		x	x	1+2	2+3

(Default settings are marked bold / blue)

Note

In the default configuration, the I²C address can be selected by the level on pin CAM_CTRL1. CAM_CTRL = GND sets the I²C address to 0x94. CAM_CTRL = VCAM sets the I²C address to 0x9C.

2 Register Overview

Data Format: 1 = always 1; 0 = always 0; d = programmable; ? = read only

Register (Hex)	Description	Data Format (Binary)	Default Value (Hex)
0x00	SENSOR_TYPE	???? ???? ???? ???? ?	-
0x01	FIRMWARE	???? ???? ???? ???? ?	-
0x02	CONTROL1	???? ???d ???? dddd	0x0103
0x03	CONTROL2	dddd dddd dddd dddd	0x1100
0x04	CONTROL3	01?? ???? ??dd dddd	0x??10
0x05	CONTROL4	dddd dddd dddd dddd	0xF100
0x06	CONTROL5	dddd dddd dddd dddd	-
0x07	CONTROL6	???? ??dd ???? dddd	0x0000
0x08	CONTROL7	???? ???? ???? ???? ?	0x0000
0x09	CONTROL8	???? ???? ???? ???? ?	0x0000
0x0A	CONTROL9	???? ???? ???? ???? ?	0x0000
0x0B	CONTROL10	???? ???? ???? ???? ?	0x0000
0x0C	CONTROL11	???? ???? ???? ???? ?	0x0000
0x0D	CONTROL12	???? ???? ???? ???? ?	0x0000
0x0E	CONTROL13	???? ???? ???? ???? ?	0x0000
0x0F	OUTPUT_CONTROL	00?? 0000 0ddd dddd	0x0031
0x10	RES_X	dddd dddd dddd dddd	-
0x11	OFFSET_X	dddd dddd dddd dddd	0x0000
0x12	RES_Y	dddd dddd dddd dddd	-
0x13	OFFSET_Y	dddd dddd dddd dddd	0x0000
0x14	Reserved	0000 0000 0000 0000	0x0000
0x15	Reserved	0000 0000 0000 0000	0x0000
0x16	Reserved	0000 0000 0000 0000	0x0000
0x17	TEMP_WINDOW_SCALE_FACTOR1	???? ???? ???? ???? ?	-
0x18	TEMP_WINDOW_SCALE_FACTOR2	???? ???? ???? ???? ?	-
0x19	TEMP_WINDOW_MIN	dddd dddd dddd dddd	-
0x1A	TEMP_WINDOW_MAX	dddd dddd dddd dddd	-
0x1B	TEMP_MIN	???? ???? ???? ???? ?	-
0x1C	TEMP_MAX	???? ???? ???? ???? ?	-
0x1D	TEMP_MEAN	???? ???? ???? ???? ?	-
0x1E	TEMP_CENTER	???? ???? ???? ???? ?	-
0x1F	Reserved	0000 0000 0000 0000	0x0000

Register (Hex)	Description	Data Format (Binary)	Default Value (Hex)
0x20	TRACK_TEMPO_CONF	dddd dddd dddd dddd	0x0000
0x21	TRACK_TEMP1_CONF	dddd dddd dddd dddd	0x0000
0x22	TRACK_TEMP2_CONF	dddd dddd dddd dddd	0x0000
0x23	TRACK_TEMP3_CONF	dddd dddd dddd dddd	0x0000
0x24	TRACK_TEMPO	dddd dddd dddd dddd	0x0000
0x25	TRACK_TEMP1	dddd dddd dddd dddd	0x0000
0x26	TRACK_TEMP2	dddd dddd dddd dddd	0x0000
0x27	TRACK_TEMP3	dddd dddd dddd dddd	0x0000
0x28	Reserved	0000 0000 0000 0000	0x0000
0x29	Reserved	0000 0000 0000 0000	0x0000
0x2A	Reserved	0000 0000 0000 0000	0x0000
0x2B	TABLE_NO	???? ???? ???? ????	-
0x2C	SENSOR_ID1	???? ???? ???? ????	-
0x2D	SENSOR_ID2	???? ???? ???? ????	-
0x2E	SERIAL_NO1	???? ???? ???? ????	-
0x2F	SERIAL_NO2	???? ???? ???? ????	-
0x30	Reserved	???? ???? ???? ????	-
0x31	Reserved	???? ???? ???? ????	-
0x32	Reserved	dddd dddd ???? ????	-
0x33	Reserved	0000 0000 0000 0000	0x0000
0x34	Reserved	0000 0000 0000 0000	0x0000
0x35	Reserved	0000 0000 0000 0000	0x0000
0x36	Reserved	0000 0000 0000 0000	0x0000
0x37	Reserved	0000 0000 0000 0000	0x0000
0x38	Reserved	0000 0000 0000 0000	0x0000
0x39	Reserved	0000 0000 0000 0000	0x0000
0x3A	Reserved	0000 0000 0000 0000	0x0000
0x3B	Reserved	0000 0000 0000 0000	0x0000
0x3C	Reserved	0000 0000 0000 0000	0x0000
0x3D	Reserved	0000 0000 0000 0000	0x0000
0x3E	Reserved	0000 0000 0000 0000	0x0000
0x3F	Reserved	0000 0000 0000 0000	0x0000
0x40	HTPA_MBIT_TRIM	0000 0000 ???? ????	-
0x41	HTPA_BIAS_TRIM_TOP	0000 0000 ???? ????	-
0x42	HTPA_BIAS_TRIM_BOT	0000 0000 ???? ????	-

Register (Hex)	Description	Data Format (Binary)	Default Value (Hex)
0x43	HTPA_CLK_TRIM	0000 0000 ???? ????	-
0x44	HTPA_BPA_TRIM_TOP	0000 0000 ???? ????	-
0x45	HTPA_BPA_TRIM_BOT	0000 0000 ???? ????	-
0x46	HTPA_PU_TRIM	0000 0000 ???? ????	-
0x47	Reserved	0000 0000 0000 0000	0x0000
0x48	Reserved	0000 0000 0000 0000	0x0000
0x49	Reserved	0000 0000 0000 0000	0x0000
0x4A	DEAD_PIX_ADDR_00	???? ???? ???? ????	-
0x4B	DEAD_PIX_ADDR_01	???? ???? ???? ????	-
0x4C	DEAD_PIX_ADDR_02	???? ???? ???? ????	-
0x4D	DEAD_PIX_ADDR_03	???? ???? ???? ????	-
0x4E	DEAD_PIX_ADDR_04	???? ???? ???? ????	-
0x4F	DEAD_PIX_ADDR_05	???? ???? ???? ????	-
0x50	DEAD_PIX_ADDR_06	???? ???? ???? ????	-
0x51	DEAD_PIX_ADDR_07	???? ???? ???? ????	-
0x52	DEAD_PIX_ADDR_08	???? ???? ???? ????	-
0x53	DEAD_PIX_ADDR_09	???? ???? ???? ????	-
0x54	DEAD_PIX_ADDR_10	???? ???? ???? ????	-
0x55	DEAD_PIX_ADDR_11	???? ???? ???? ????	-
0x56	DEAD_PIX_ADDR_12	???? ???? ???? ????	-
0x57	DEAD_PIX_ADDR_13	???? ???? ???? ????	-
0x58	DEAD_PIX_ADDR_14	???? ???? ???? ????	-
0x59	DEAD_PIX_ADDR_15	???? ???? ???? ????	-
0x5A	DEAD_PIX_ADDR_16	???? ???? ???? ????	-
0x5B	DEAD_PIX_ADDR_17	???? ???? ???? ????	-
0x5C	DEAD_PIX_ADDR_18	???? ???? ???? ????	-
0x5D	DEAD_PIX_ADDR_19	???? ???? ???? ????	-
0x5E	DEAD_PIX_ADDR_20	???? ???? ???? ????	-
0x5F	DEAD_PIX_ADDR_21	???? ???? ???? ????	-
0x60	DEAD_PIX_ADDR_22	???? ???? ???? ????	-
0x61	DEAD_PIX_ADDR_23	???? ???? ???? ????	-

3 Shadowed Registers

In order to avoid inconsistent behavior, some sensor settings cannot be changed during frame readout. Due to this, some registers have double-buffers to implement a “pending” and a “live” version. Access is available to the pending register only via I²C read/write. The live register controls the camera module operation. The value in the pending register is transferred to a live register at a fixed point in the frame timing, called “frame-start.” Frame-start is defined as the point at which the sensor begins to sample the first block. To determine which registers or register fields are double-buffered this way, see the “Shadowed” column in the following tables.

Notations used in the register description table:

- Shdw (Shadowed)
 - N = No. The register value is updated and used immediately.
 - Y = Yes. The register value is updated at next frame start.
- Read/Write
 - R = Read-only register/bit.
 - W = Write-only register/bit.
 - R/W = Read-Write register/bit

4 Register Descriptions

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
0x00 – SENSOR_TYPE						
7:0	Sensor Type	1 = HTPA32x32d Sensor 2 = HTPA80x64d Sensor	-	N	1,2	R
15:8	Table Type	0 = HTPA32x32 1 = HTPA32x32 precise 2 = HTPA32x32R1 3 = HTPA32x32R1 precise 4 = HTPA80x64 5 = HTPA80x64 precise 6 = HTPA80x64R1 7 = HTPA80x64R1 precise 8 = HTPA32x32 R1 extended Ta	-	N	0...7	R
0x01 – FIRMWARE						
7:0	Minor Revision	Revision of Firmware, decimal	-	N	0...255	R
15:8	Major Revision	Revision of Firmware, predecimal	-	N	0...255	R
0x02 – CONTROL1						
0	Sensor Enable Sampling	0 = Disable image sampling 1 = Enable image sampling (depends on 'CONTROL_2', 'Snapshot Mode')	1	Y	0,1	R/W
1	Sensor Power On	Turn On/Off Sensor Power. Wait about 100 ms between changes of this bit. The 'Sensor Reset' bit is set automatically after 'Sensor Power On' has been toggled. The Power-On-Procedure takes about 200 ms. 0 = Disable Sensor Power supply 1 = Enable Sensor Power supply	1	Y	0,1	R/W
2	Sensor Reset	Perform an automatic reset of the sensor. The sensor-reset procedure takes about 200 ms. This is a self-resetting bit which should always read '0'. 0 = Normal operation 1 = Perform sensor reset	0	Y	0,1	R/W
3	Module Reset	Perform an automatic reset of the entire camera module. This is a self-resetting bit which should always read '0'. 0 = Normal operation 1 = Perform module reset	0	Y	0,1	R/W
7:4	Reserved	Reserved	-	Y	0...255	R
8	Sensor Interface	Set Sensor Interface Performance 0 = Conservative Interface Timing.	1	Y	0,1	R/W

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
	Performance	Use this option if interface problems occur 1 = Performance Interface Timing. Use this option for best camera performance 'Sensor Power On' has to set to '0' before changing this bit.				
15:9	Reserved	Reserved	-	Y	0...127	R
0x03 – CONTROL2						
3:0	Snapshot Mode	0 = Continuous Mode (Snapshot Mode disabled) 1 = Hardware trigger. Frame acquisition is started at a high-level applied to the CAM_TRIG input. 2 = Software trigger. Frame acquisition is started by setting the bit 'Sensor Enable Sampling' to 1. 'Sensor Enable Sampling' is reset automatically. 3...15 = Reserved (depends on 'CONTROL_1', 'Sensor Enable Sampling')	0	Y	0...2	R/W
7:4	Strobe Mode	0 = Disable strobe pulse 1 = Enable strobe pulse. Generates a high-pulse at STROBE-Pin while the sensor is sampling an image. 2...15 = Reserved (depends on 'CONTROL_1', 'Sensor Enable Sampling')	0	Y	0,1	R/W
11:8	Enable Auto-Scale Mode	The camera module automatically scales the temperature values depending on 'Temperature Resolution' 0 = Reserved 1 = Full dynamic scale. 2 = Fixed Temp_Min scale. For this the 'TEMP_WINDOW_MIN' register has to be set. 3 = Fixed Temp_Max scale. For this the 'TEMP_WINDOW_MAX' register has to be set. 4 = Scale by mean temperature. (depends on 'Auto-Scale Metering') 5 = Scale by TRACK_TEMPO. 6...15 = Reserved	1	Y	0...5	R/W
15:12	Auto-Scale Metering	If Auto-Scale-Mode is used, a metering mode has to selected. 0 = Disable Auto-Scale-Mode.	1	Y	0...3	R/W

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
		Temperature window is user defined by 'TEMP_WINDOW_MIN' and 'TEMP_WINDOW_MAX' registers. 1 = Auto scale by entire image. 2 = Center-weighted. Like entire image, but the central 25 % of the image are double-weighted. 3 = Spot. The central 64 Pixel are used only. 4...15 = Reserved				
0x04 – CONTROL3						
3:0	Generate Test Pattern	0 = Disable test pattern / Enable thermal image 1 = Test pattern: Incrementing 2 = Test pattern: Walking Bit 3 = Test pattern: Horizontal Bars 4 = Test pattern: Vertical Bars 5 = Test pattern: Mosaic 6...15 = Reserved	0	Y	0...5	R/W
5:4	Flip Image	0 = Not flipped 1 = Flip image horizontally 2 = Flip image vertically 3 = Flip image horizontally and vertically	1	Y	0...3	R/W
7:6	Reserved	Reserved	-	Y	0...3	R
12:8	Dead Pixel Count	Amount of defect Pixels given from the Sensor. Refer to sensor datasheet	-	N	0...24	R
13	Enable Dead Pixel Correction	Enable/ Disable Dead Pixel Correction. 0 = Disable Dead Pixel Correction 1 = Enable Dead Pixel Correction	1	Y	0,1	R/W
15:14	Reserved	Reserved	-	Y	0...3	R
0x05 – CONTROL4						
15:0	Reserved	Reserved	-	Y	0...65535	R/W
0x06 – CONTROL5						
15:0	Sample Timer Period	Period for the sample timer. Unit: ms * 100 e.g. 25ms = 2500 Needs to be adjusted if sensor settings are changed by the user.	-	Y	0...65535	R/W
0x07 – CONTROL6						
3:0	Filter	Different filters performed while processing a block to reduce noise in the image. 0 = Disable Filter 2 = Box-Blur	0	Y	0...8	R/W

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
		4 = Binomial 6 = Gaussian while processing 8 = Median Gaussian filter comes with a constant sigma of $\sqrt{2/\pi} \approx 0.79788456$				
7:4	Reserved	Reserved	-	Y	0...15	R
8:9	Average Mode	To decrease noise in the image, averaging of consecutive images can be enabled. A moving average algorithm is used to get the fastest response time of the image. 0 = Disable average 1 = Weak average (2 images used) 2 = Medium average (3 images used) 3 = Strong average (4 images used)	0	Y	0...3	R/W
10:15	Reserved	Reserved	-	Y	0...63	R
0x08 – CONTROL7						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x09 – CONTROL8						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x0A – CONTROL9						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x0B – CONTROL10						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x0C – CONTROL11						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x0D – CONTROL12						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x0E – CONTROL13						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x0F – OUTPUT_CONTROL						
3:0	Temperature Resolution	0 = 8 Bit 1 = 10 Bit 2 = 12 Bit 4 = 16 Bit (2x8 Bit, big endian)	1	Y	0,1,2,4	R/W
4	Pixel Clock Polarity	0 = Valid Data on falling PCLK-Edge 1 = Valid Data on rising PCLK-Edge	1	Y	0,1	R/W
5	Interface Performance	Interface Performance 0 = No output acceleration. 1 = Automatic. Accelerated output by scaling temperature values with the scale factor of the previous frame. If 16 Bit 'Temperature Resolution' is chosen, this Bit is set to '0'	1	Y	0,1	R/W

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
		automatically.				
6	Interface Accuracy	Interface Accuracy 0 = min. 1 LSB. Sloppy quantization at higher output speed. 1 = min. 0.5 LSB. Best quantization but lower output speed.	1	Y	0,1	R/W
11:7	Reserved	Reserved	-	Y	0,1	R
12	Embed Image Information	0 = Embedded image information is disabled 1 = Embedded image information is enabled	0	Y	0,1	R
13	Overflow Flag	0 = All measured temperatures of the frame fit into the temperature window. 1 = Over-/Underflow occurred: At least one measured temperature of the current frame is outside the temperature window.	-	Y	0,1	R
15:14	Reserved	Reserved	-	Y	0...3	R
0x10 – RES_X						
15:0	Sensor X-Resolution	By using 'RES_X', 'OFFSET_X', 'RES_Y' and 'OFFSET_Y' the image can windowed.	32 / 80	Y	1...32 / 80	R/W
0x11 – OFFSET_X						
15:0	Sensor X-Offset	By using 'RES_X', 'OFFSET_X', 'RES_Y' and 'OFFSET_Y' the image can windowed.	0	Y	0...31 / 79	R/W
0x12 – RES_Y						
15:0	Sensor Y-Resolution	By using 'RES_X', 'OFFSET_X', 'RES_Y' and 'OFFSET_Y' the image can windowed. If set to 34 (HTPA32x32d) or 66 (HTPA80x64d) the camera attaches two additional rows to each frame that contain information about the actual image. Only available at full x-resolution.	32 / 64	Y	1...32, 34 / 64, 66	R/W
0x13 – OFFSET_Y						
15:0	Sensor Y-Offset	By using 'RES_X', 'OFFSET_X', 'RES_Y' and 'OFFSET_Y' the image can windowed.	0	Y	0...31 / 63	R/W
0x14 – Reserved						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x15 – Reserved						
15:0	Reserved	Reserved	-	Y	0...65535	R

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
0x16 – Reserved						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x17 – TEMP_WINDOW_SCALE_FACTOR1						
15:0	Temp Window Scale Factor MSB	Holds the MSB of a 32-bit float used to rescale a received data word back to a temperature value. Depending on 'Enable Auto-Scale-Mode'. This register holds a fixed value if 'Enable Auto-Scale-Mode' is set to 0 or 2. If 'Enable Auto-Scale-Mode' is set to 1 or 3 this register holds the value used to auto-scale the temperature values of each frame. In this case TEMP_WINDOW_SCALE_FACTOR1 is updated on each frame.	-	Y	0...65535	R
0x18 – TEMP_WINDOW_SCALE_FACTOR2						
15:0	Temp Window Scale Factor LSB	Holds the LSB of a 32-bit float used to rescale a received data word back to a temperature value. Depending on 'Enable Auto-Scale-Mode'. This register holds a fixed value if 'Enable Auto-Scale-Mode' is set to 0 or 2. If 'Enable Auto-Scale-Mode' is set to 1 or 3 this register hold the value used to auto-scale the temperature values of each frame. In this case TEMP_WINDOW_SCALE_FACTOR2 is updated on each frame.	-	Y	0...65535	R
0x19 – TEMP_WINDOW_MIN						
15:0	Temperature Window Min	Holds an unsigned value used to rescale the received data word back to a temperature value. Depending on 'Enable Auto-Scale-Mode'. This register holds a fixed value (set by user) if 'Enable Auto-Scale-Mode' is set to 0 or 2. If 'Enable Auto-Scale-Mode' is set to 1 or 3 this register holds the value used to auto-scale the temperature values of each frame. In this case TEMP_WINDOW_MIN is updated on each frame.	-	Y	0...65535	R/W

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
0x1A – TEMP_WINDOW_MAX						
15:0	Temperature Window Max	Hold an unsigned value used to scale a sampled temperature value to the used data word width. Depending on 'Enable Auto-Scale-Mode'. This register holds a fixed value (set by user) if 'Enable Auto-Scale-Mode' is set to 0 or 2. If 'Enable Auto-Scale-Mode' is set to 1 or 3, this register holds the value used to auto-scale the temperature values of each frame. In this case TEMP_WINDOW_MAX is updated on each frame	-	Y	0...65535	R/W
0x1B – TEMP_MIN						
15:0	Temperature Min	Holds the lowest temperature of the current frame as an unsigned value of each frame. TEMP_MIN is updated on each frame.	-	Y	0...65535	R
0x1C – TEMP_MAX						
15:0	Temperature Max	Holds the highest temperature of the current frame as an unsigned value. TEMP_MAX is updated on each frame.	-	Y	0...65535	R
0x1D – TEMP_MEAN						
15:0	Temperature Mean	Holds the mean temperature of the current frame as an unsigned value. TEMP_MEAN is updated on each frame.	-	Y	0...65535	R
0x1E – TEMP_CENTER						
15:0	Temperature Center	Holds the image center temperature of the current frame as an unsigned value. TEMP_CENTER is updated on each frame.	-	Y	0...65535	R
0x1F – Reserved						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x20 – TRACK_TEMPO_CONF						
12:0	Pixel Number	Number of the pixel that is to be tracked if 'Tracking Mode' is set to 1.	0	Y	0...1023 / 5119	R/W

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
14:13	Tracking Mode	0 = disable tracking channel 0 1 = 'TRACK_TEMPO' holds the temperature value of the pixel according to 'Pixel Number'. 2 = If one pixel of the entire image is equal or less the user-defined 'TRACK_TEMPO'-value the 'Tracking Flag 0' is set to '1'. 3 = If one pixel of the entire image is greater or equal the user-defined 'TRACK_TEMPO'-value the 'Tracking Flag 0' is set to '1'.	0	Y	0...3	R/W
15	Tracking Flag 0	Depends on 'Tracking Mode'	0	Y	0,1	R
0x21 – TRACK_TEMP1_CONF						
12:0	Pixel Number	Number of the pixel that is to be tracked if 'Tracking Mode' is set to 1.	0	Y	0...1023 / 5119	R/W
14:13	Tracking Mode	0 = disable tracking channel 1 1 = 'TRACK_TEMP1' holds the temperature value of the pixel according to 'Pixel Number'. 2 = If one pixel of the entire image is equal or less the user defined 'TRACK_TEMP1'-value the 'Tracking Flag 1' is set to '1'. 3 = If one pixel of the entire image is greater or equal the user-defined 'TRACK_TEMP1'-value the 'Tracking Flag 1' is set to '1'.	0	Y	0...3	R/W
15	Tracking Flag 1	Depends on 'Tracking Mode'	0	Y	0,1	R
0x22 – TRACK_TEMP2_CONF						
12:0	Pixel Number	Number of the pixel that is to be tracked if 'Tracking Mode' is set to 1.	0	Y	0...1023 / 5119	R/W
14:13	Tracking Mode	0 = disable tracking channel 2 1 = 'TRACK_TEMP2' holds the temperature value of the pixel according to 'Pixel Number'. 2 = If one pixel of the entire image is equal or less the user defined 'TRACK_TEMP2'-value the 'Tracking Flag 2' is set to '1'. 3 = If one pixel of the entire image is greater or equal the user-defined 'TRACK_TEMP2'-value the 'Tracking Flag 2' is set to '1'.	0	Y	0...3	R/W
15	Tracking Flag 2	Depends on 'Tracking Mode'	0	Y	0,1	R

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
0x23 – TRACK_TEMP3_CONF						
12:0	Pixel Number	Number of the Pixel that is to be tracked if 'Tracking Mode' is set to 1.	0	Y	0...1023 / 5119	R/W
14:13	Tracking Mode	0 = disable tracking channel 3 1 = 'TRACK_TEMP3' holds the temperature value of the pixel according to 'Pixel Number'. 2 = If one pixel of the entire image is equal or less the user defined 'TRACK_TEMP3'-value the 'Tracking Flag 3' is set to '1'. 3 = If one pixel of the entire image is greater or equal the user-defined 'TRACK_TEMP3'-value the 'Tracking Flag 3' is set to '1'.	0	Y	0...3	R/W
15	Tracking Flag3	depends on 'Tracking Mode'	0	Y	0,1	R
0x24 – TRACK_TEMP0						
15:0	Track Temp 0	depends on 'TRACK_TEMP0_CONF'	0	Y	0...65535	R/W
0x25 – TRACK_TEMP1						
15:0	Track Temp 1	depends on 'TRACK_TEMP1_CONF'	0	Y	0...65535	R/W
0x26 – TRACK_TEMP2						
15:0	Track Temp 2	depends on 'TRACK_TEMP2_CONF'	0	Y	0...65535	R/W
0x27 – TRACK_TEMP3						
15:0	Track Temp 3	depends on 'TRACK_TEMP3_CONF'	0	Y	0...65535	R/W
0x28 – Reserved						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x29 – Reserved						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x2A – Reserved						
15:0	Reserved	Reserved	-	Y	0...65535	R
0x2B – TABLE_NO						
15:0	Table Number	Contains a unique number for the mounted sensor and optic. Stored in the sensor EEPROM.	-	N	0...65535	R
0x2C – SENSOR_ID1						
15:0	Sensor ID MSB	MSB of 'DeviceID' stored in the sensor EEPROM.	-	N	0...65535	R
0x2D – SENSOR_ID2						
15:0	Sensor ID LSB	LSB of 'DeviceID' stored in the sensor EEPROM.	-	N	0...65535	R
0x2E – SERIAL_NO1						
15:0	Serial Number MSB	MSB of the camera modules serial number	-	N	0...65535	R

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
0x2F – SERIAL_NO2						
15:0	Serial Number LSB	LSB of the camera modules serial number	-	N	0...65535	R
0x30 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x31 – Reserved						
15:8	Reserved	Reserved	-	N	0...65535	R
0x32 – Reserved						
15:8	Reserved	Reserved	-	N	0...65535	R
0x33 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x34 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x35 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x36 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x37 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x38 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x39 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x3A – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x3B – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x3C – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x3D – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x3E – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x3F – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x40 – HTPA_MBIT_TRIM						
7:0	MBIT_TRIM	Refer to sensor datasheet	-	N	0...255	R
15:8	Reserved	Reserved	-	N	0...255	R

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
0x41 – HTPA_BIAS_TRIM_TOP						
7:0	BIAS_TRIM_TOP	Refer to sensor datasheet	-	N	0...255	R
15:8	Reserved	Reserved	-	N	0...255	R
0x42 – HTPA_BIAS_TRIM_BOT						
7:0	BIAS_TRIM_BOT	Refer to sensor datasheet	-	N	0...255	R
15:8	Reserved	Reserved	-	N	0...255	R
0x43 – HTPA_CLK_TRIM						
7:0	CLK_TRIM	Refer to sensor datasheet	-	N	0...255	R
15:8	Reserved	Reserved	-	N	0...255	R
0x44 – HTPA_BPA_TRIM_TOP						
7:0	BPA_TRIM_TOP	Refer to sensor datasheet	-	N	0...255	R
15:8	Reserved	Reserved	-	N	0...255	R
0x45 – HTPA_BPA_TRIM_BOT						
7:0	BPA_TRIM_BOT	Refer to sensor datasheet	-	N	0...255	R
15:8	Reserved	Reserved	-	N	0...255	R
0x46 – HTPA_PU_TRIM						
7:0	PU_TRIM	Refer to sensor datasheet	-	N	0...255	R
15:8	Reserved	Reserved	-	N	0...255	R
0x47 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x48 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x49 – Reserved						
15:0	Reserved	Reserved	-	N	0...65535	R
0x4A – DEAD_PIX_ADDR_00						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 00	-	N	0...65535	R
0x4B – DEAD_PIX_ADDR_01						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 01	-	N	0...65535	R
0x4C – DEAD_PIX_ADDR_02						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 02	-	N	0...65535	R
0x4D – DEAD_PIX_ADDR_03						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 03	-	N	0...65535	R
0x4E – DEAD_PIX_ADDR_04						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 04	-	N	0...65535	R

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
0x4F – DEAD_PIX_ADDR_05						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 05	-	N	0...65535	R
0x50 – DEAD_PIX_ADDR_06						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 06	-	N	0...65535	R
0x51 – DEAD_PIX_ADDR_07						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 07	-	N	0...65535	R
0x52 – DEAD_PIX_ADDR_08						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 08	-	N	0...65535	R
0x53 – DEAD_PIX_ADDR_09						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 09	-	N	0...65535	R
0x54 – DEAD_PIX_ADDR_10						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 10	-	N	0...65535	R
0x55 – DEAD_PIX_ADDR_11						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 11	-	N	0...65535	R
0x56 – DEAD_PIX_ADDR_12						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 12	-	N	0...65535	R
0x57 – DEAD_PIX_ADDR_13						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 13	-	N	0...65535	R
0x58 – DEAD_PIX_ADDR_14						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 14	-	N	0...65535	R
0x59 – DEAD_PIX_ADDR_15						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 15	-	N	0...65535	R
0x5A – DEAD_PIX_ADDR_16						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 16	-	N	0...65535	R
0x5B – DEAD_PIX_ADDR_17						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 17	-	N	0...65535	R
0x5C – DEAD_PIX_ADDR_18						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 18	-	N	0...65535	R

Bit	Field Name	Bit Description	Default Value (Dec)	Shdw	Range (Dec)	Read/Write
0x5D – DEAD_PIX_ADDR_19						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 19	-	N	0...65535	R
0x5E – DEAD_PIX_ADDR_20						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 20	-	N	0...65535	R
0x5F – DEAD_PIX_ADDR_21						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 21	-	N	0...65535	R
0x60 – DEAD_PIX_ADDR_22						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 22	-	N	0...65535	R
0x61 – DEAD_PIX_ADDR_23						
15:0	Dead Pixel Address	Contains the pixel number for Dead Pixel 23	-	N	0...65535	R

Please contact our technical support if you need additional information, or if you have any questions.

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