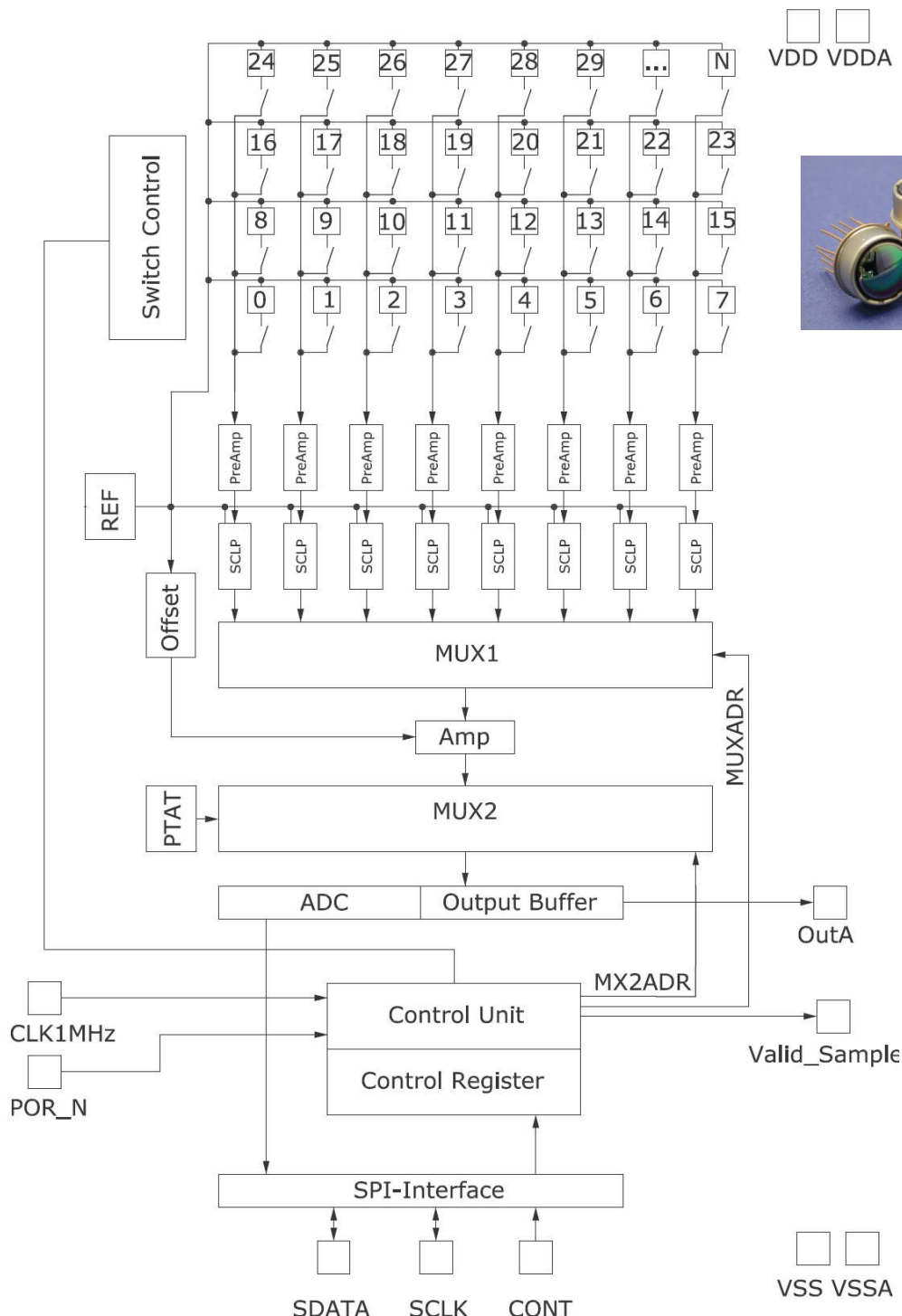


# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



## Principal Schematic for HTPA16x16:



**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

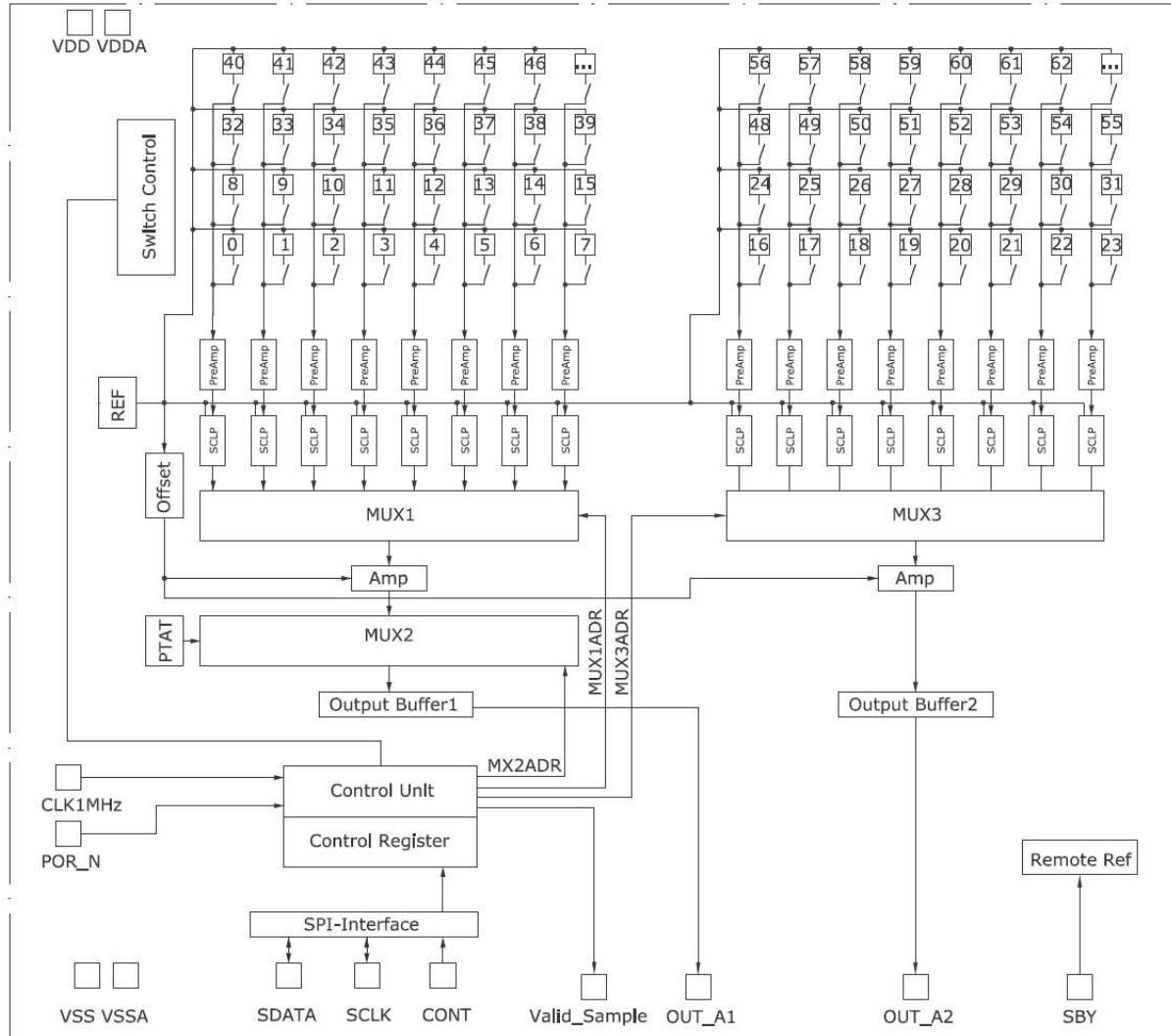
**Internet**  
[www.heimanssensor.com](http://www.heimanssensor.com)  
mail: [info@heimanssensor.com](mailto:info@heimanssensor.com)

# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



## Principal Schematic for HTPA32x31:



**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

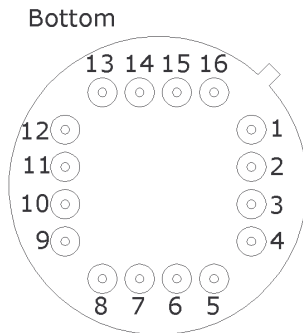
**Internet**  
[www.heimanssensor.com](http://www.heimanssensor.com)  
mail: [info@heimanssensor.com](mailto:info@heimanssensor.com)

# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



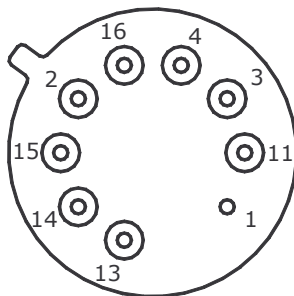
## Pin Assignment in TO8 for 8x8:



Connect all reference voltages via 100 nF capacitors to VSS.

## Pin Assignment in TO39 for 8x8:

Bottom



Connect all reference voltages via 100 nF capacitors to VSS.

Pin Assignment 8x8			
Pin	Name	Description	Type
1	VSS	Negative power supply voltage	Power
2	CONT	Control Pin for SPI	Digital Input
3	OUT_A	Analog Output	Analog Output
4	VCM_C	Common mode voltage	Reference Voltage*
5	VCM_OUT	Common mode voltage	Reference Voltage*
6	VREF_N	Negative reference voltage for ADC	Reference Voltage*
7	VREF_P	Positive reference voltage for ADC	Reference Voltage*
8	VREF_1225V	1.225V reference voltage	Reference Voltage*
9	AGND	Analog ground for ADC	Reference Voltage*
10	VDDA	Positive power supply voltage	Power
11	VDD	Positive power supply voltage	Power
12	POR_N	Power on reset, negatived	Digital Input
13	CLK_1MHZ	Master clock	Digital Input
14	VSAM	Valid sample	Digital Output
15	SCLK_IO	Clock input/output for SPI	Digital Input/Output
16	DATA_IO	Data input/output for SPI	Digital Input/Output

\*) Connect via 100 nF to VSS

**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

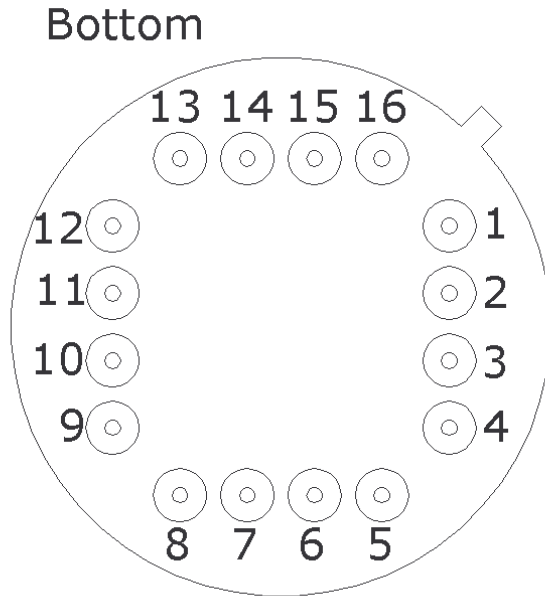
**Internet**  
[www.heimanssensor.com](http://www.heimanssensor.com)  
mail: [info@heimanssensor.com](mailto:info@heimanssensor.com)

# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



## Pin Assignment in TO8 for 16x16:



Connect all reference voltages via 100 nF capacitors to VSS.

Pin Assignment 16x16			
Pin	Name	Description	Type
1	VREF_N	negative reference voltage for ADC	Reference Voltage*
2	VREF_P	positive reference voltage for ADC	Reference Voltage*
3	AGND	analog ground for ADC	Reference Voltage*
4	OUT_A	Analog Output	Analog Output
5	VCM_OUT	common mode voltage	Reference Voltage*
6	VCM_C	common mode voltage	Reference Voltage*
7	VREF_1225V	1.225V reference voltage	Reference Voltage*
8	VDD/VDDA	positive power supply voltage	Power
9	VSAM	valid sample	Digital Output
10	SCLK_IO	clock input/output for SPI	Digital Input/Output
11	CLK_1MHZ	master clock	Digital Input
12	POR_N	power on reset, negated	Digital Input
13	SBY	Standby	Digital Input
14	VSS	negative power supply voltage	Power
15	DATA_IO	data input/output for SPI	Digital Input/Output
16	CONT	Control Pin for SPI	Digital Input

\*) Connect via 100 nF to VSS

**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimanssensor.com](http://www.heimanssensor.com)  
mail: [info@heimanssensor.com](mailto:info@heimanssensor.com)

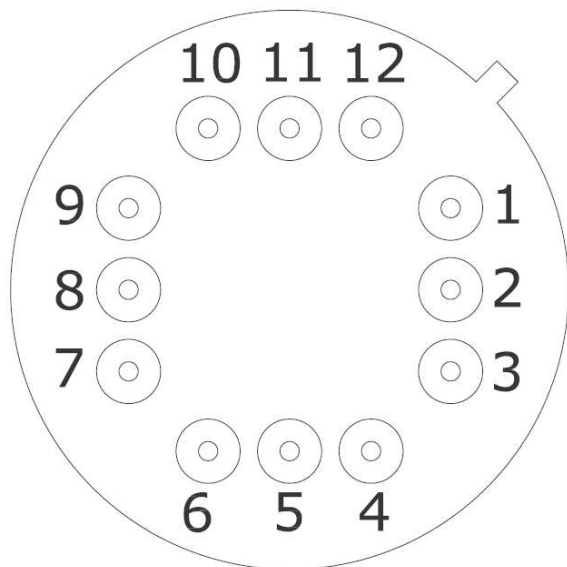
# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



## Pin Assignment in TO8 for 32x31:

### Bottom



Connect all reference voltages via 100 nF capacitors to VSS.

Pin Assignment 32x31			
Pin	Name	Description	Type
1	CLK_1MHZ	master clock	Digital Input
2	SCLK_IO	clock input/output for SPI	Digital Input/Output **
3	SBY	Standby	Digital Input***
4	VSAM	valid sample	Digital Output
5	DATA_IO	data input/output for SPI	Digital Input/Output **
6	OUT_A2	Analog Output	Analog Output
7	VCM_C	common mode voltage	Reference Voltage*
8	VREF_1225V	1.225V reference voltage	Reference Voltage*
9	OUT_A1	Analog Output	Analog Output
10	VSS	negative power supply voltage	Power
11	VDD	positive power supply voltage	Power
12	CONT	Control Pin for SPI	Digital Input

\*) Connect via 100 nF to VSS

\*\*) The HTPA32x31 has no ADC, but the valid sample cycle number is delivered.

\*\*\*) Connect to VSS or NC for internal reference voltages. Connect to VDD if VREF\_1225V and VCM\_C are applied from external. See “Application Note HTPA” for details.

**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)

# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg

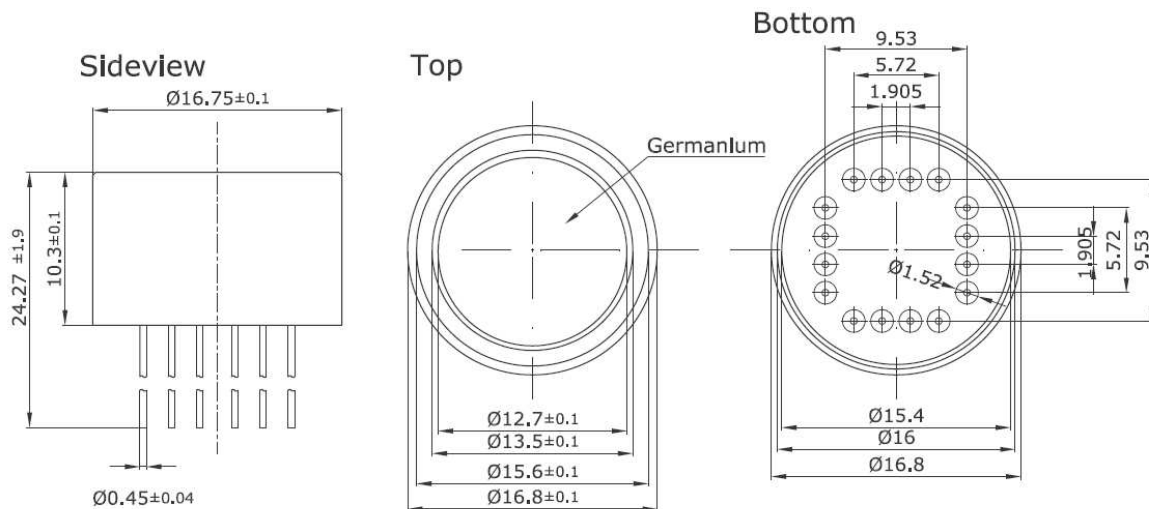


## Possible Lens / Array type combinations:

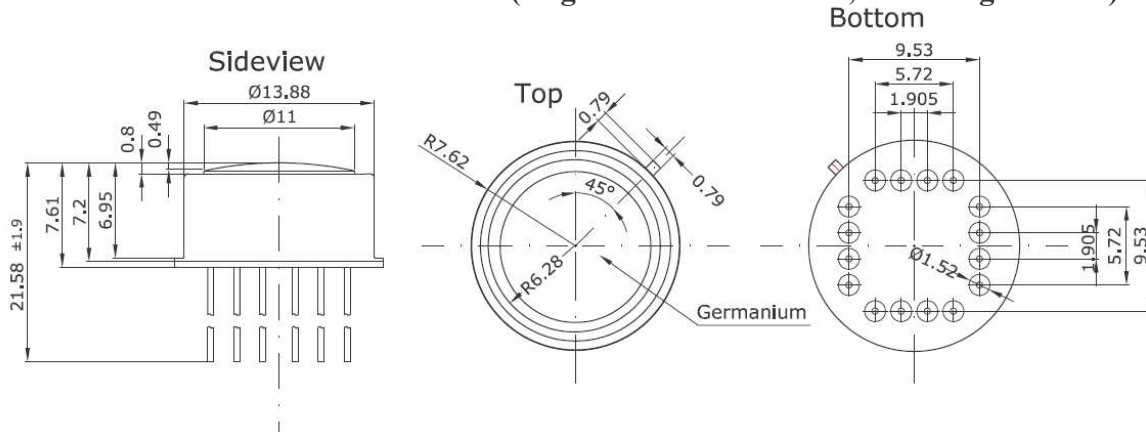
Possible Combinations						
Lens	HTPA8x8 TO39	HTPA8x8 TO8	HTPA16x16	HTPA32x31	HTPA64x62	Remarks
L3	X	X	X	-	-	TO8:f/0.5 TO39:f/0.58 Ge
L4	-	X	X	X	X	f/0.45 Ge
L5.5	X	-	-	-	-	f/1.0 Si
L7/0.7	-	X	X	X	X	f/0.67 Ge
L7/1.0	X	-	-	-	-	f/0.98 Ge
L10/0.8	-	X	X	X	X	f/0.8 Dual Ge
L10/1.0	-	X	X	X	X	f/1.0 Dual Ge

## Outer Dimensions:

### HTPA8x8L7 / HTPA16x16L7 in TO8 (single Germanium Lens, focal length 7 mm):



### HTPA8x8L4 / HTPA16x16L4 in TO8 (single Germanium Lens, focal length 4 mm):



**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimanssensor.com](http://www.heimanssensor.com)  
mail: [info@heimanssensor.com](mailto:info@heimanssensor.com)

# Specifications for Thermopilearrays

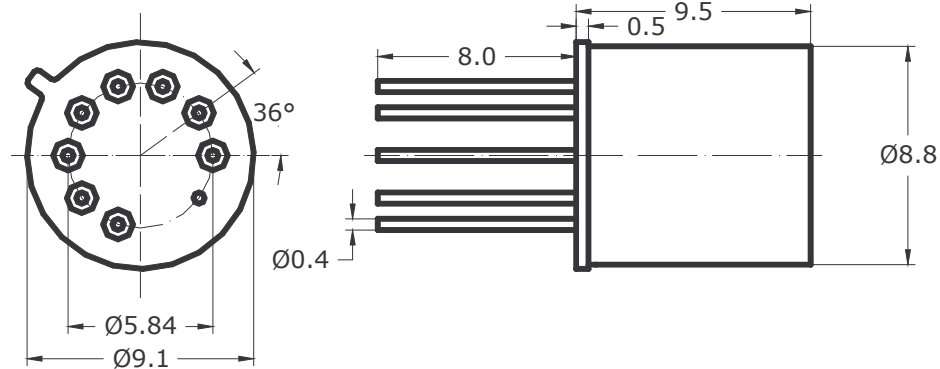
## HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg

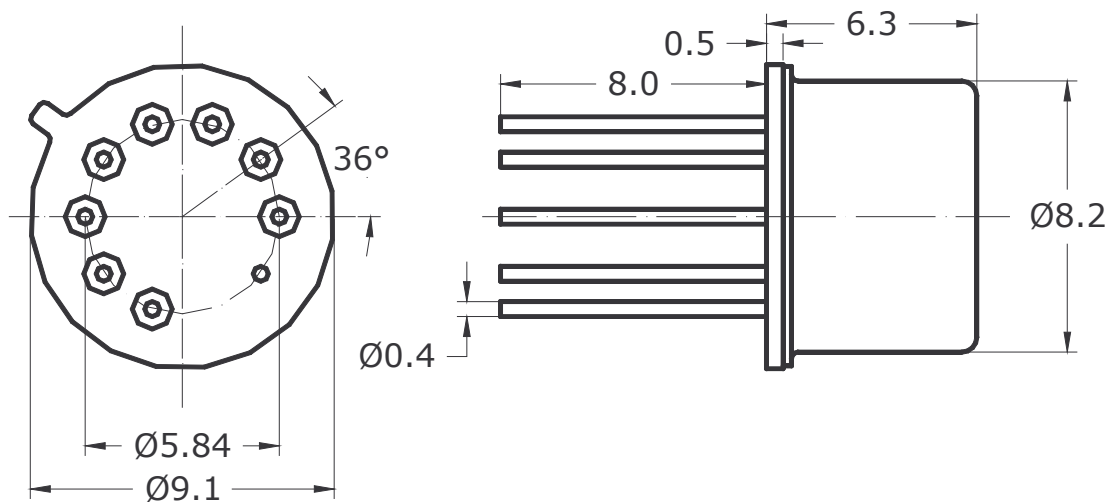


### Outer Dimensions (continued):

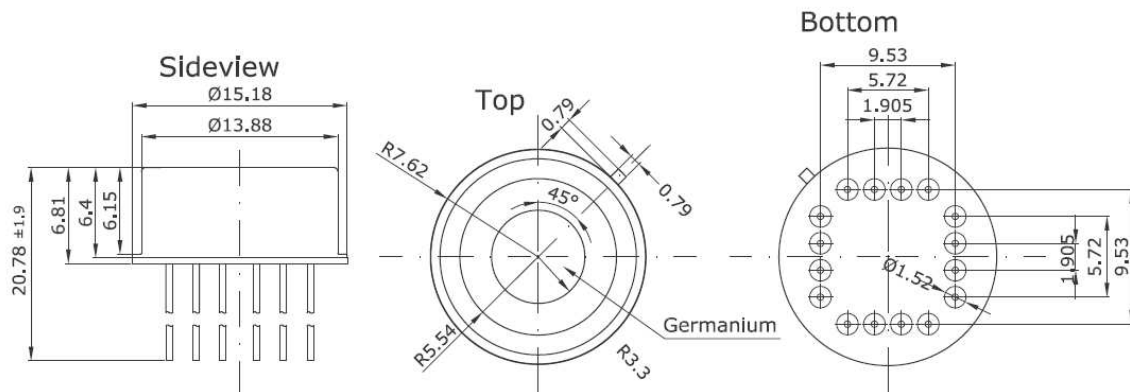
HTPA8x8L7 in TO39 (single Germanium Lens, focal length 7 mm), preliminary:



HTPA8x8L3 in TO39 (single Germanium Lens, focal length 3 mm), preliminary:



HTPA8x8L3 / HTPA16x16L3 in TO8 (single Germanium Lens, focal length 3 mm):



**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)

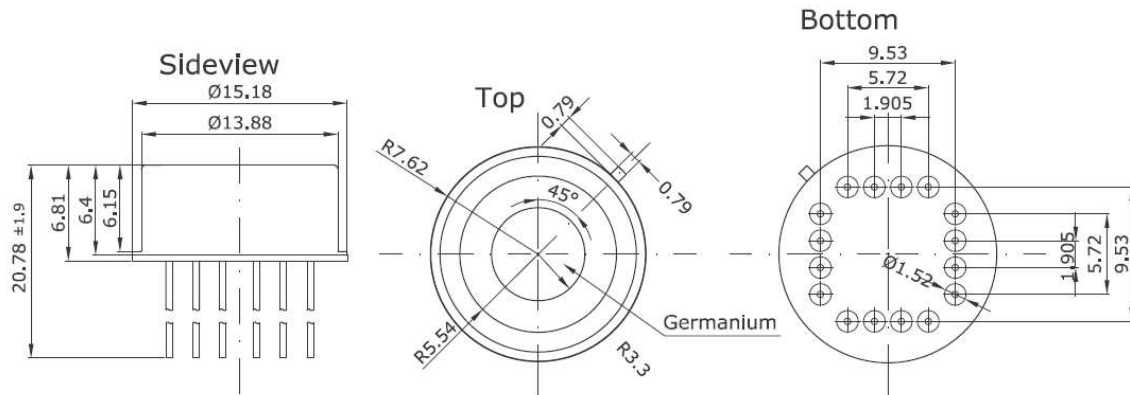
# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg

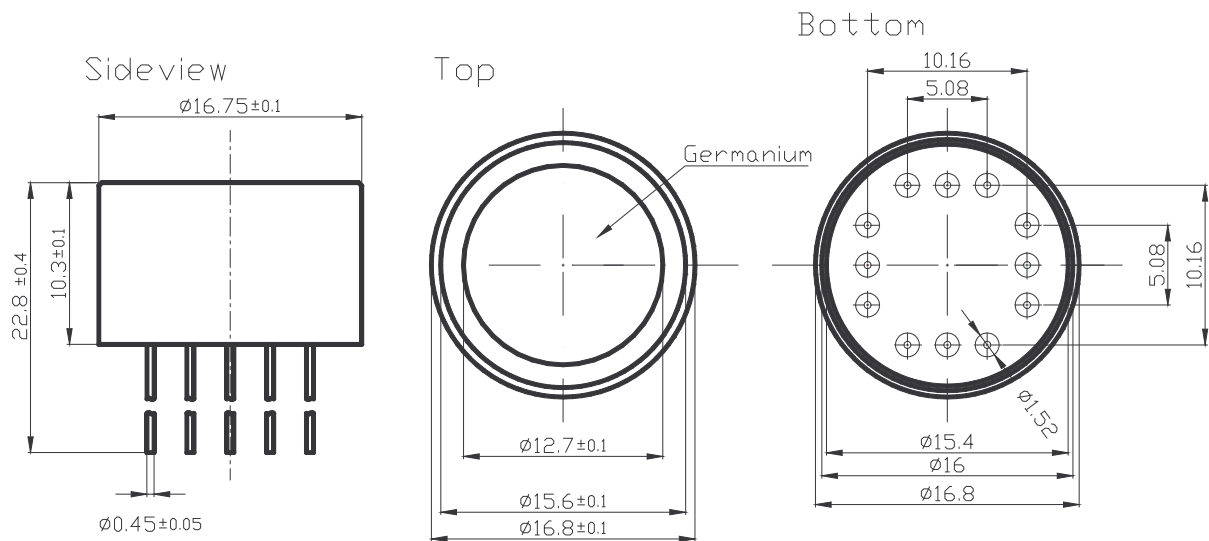


## Outer Dimensions (continued):

### HTPA8x8L3 / HTPA16x16L3 in TO8 (single Germanium Lens, focal length 3 mm):



### HTPA32x31L7 in TO8 (single Germanium Lens, focal length 7 mm):



**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)



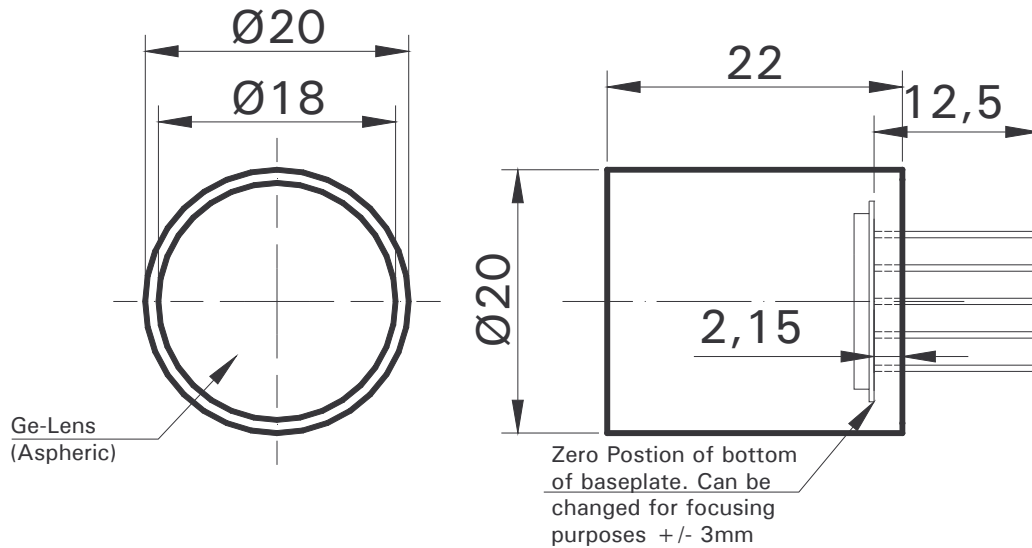
# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg

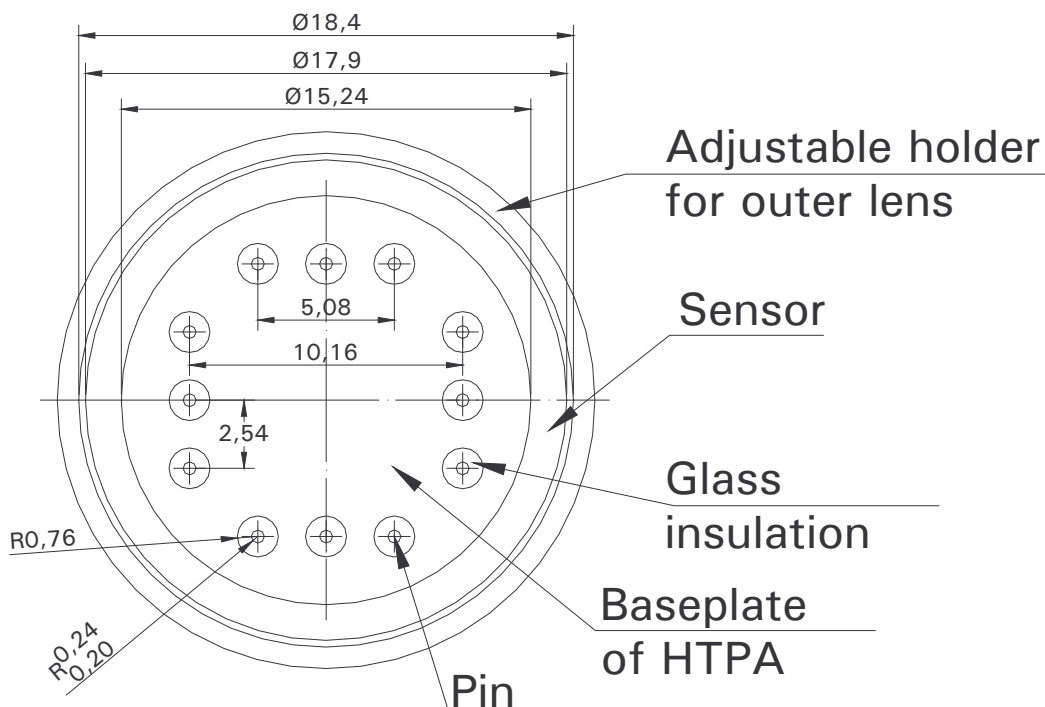


## Outer Dimensions (continued):

HTPA32x31L10/0.8 (dual Germanium Aspherical/Spherical lens combination, focal length 10mm):



## Bottom view:



**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

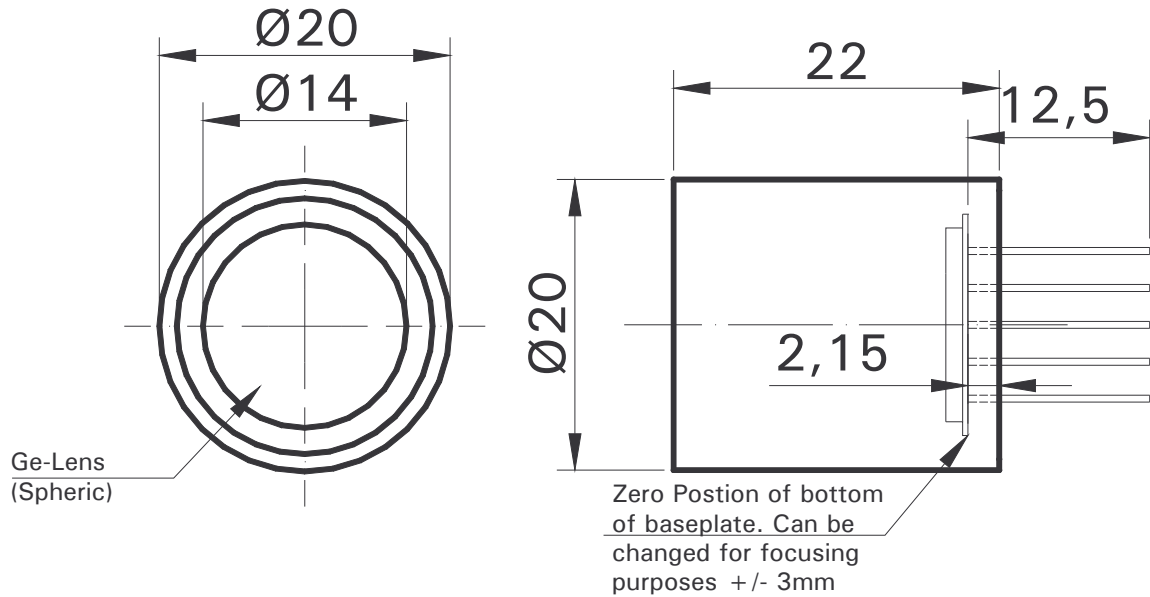
**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)

# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

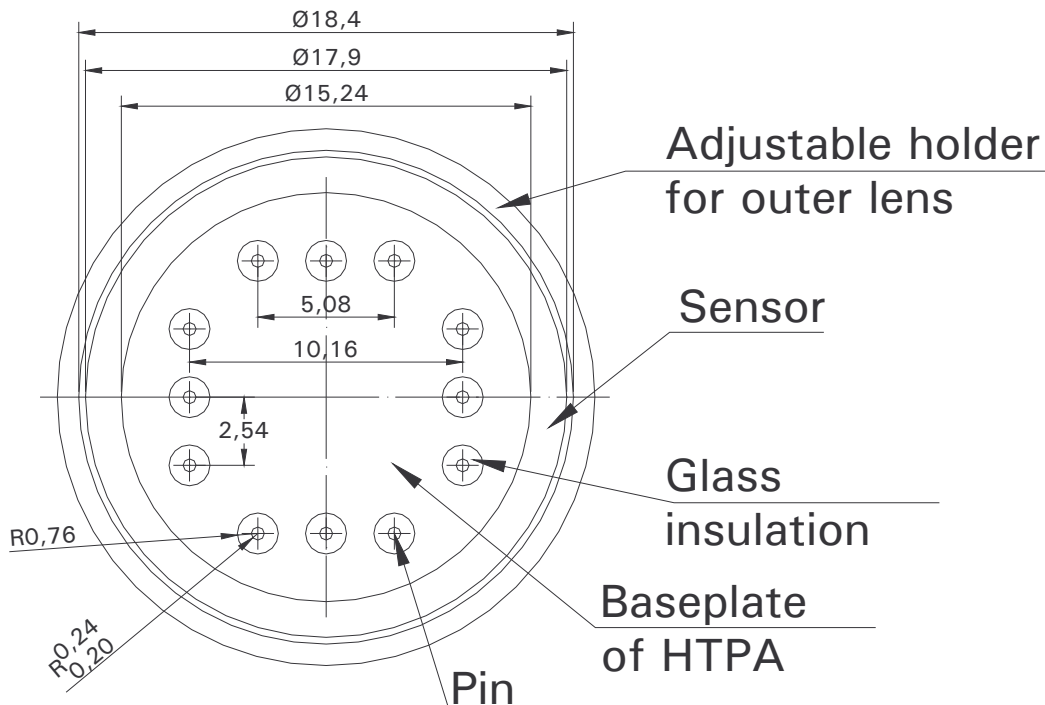
Rev.12: 2010.08.03 Fg



**HTPA32x31L10/1.0 (dual Germanium Spherical/Spherical lens combination, focal length 10mm):**



**Bottom view:**



**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimanssensor.com](http://www.heimanssensor.com)  
mail: [info@heimanssensor.com](mailto:info@heimanssensor.com)

# Specifications for Thermopilearrays

## HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



### Internal Register Map 8x8 and 16x16:

Num	Name	Function	Default	Notes
0	R	Reset	0	In case of 1, the mux pixel counter is reset. ASIC stays in reset.
1	OPCTLL	Operating point control low	1	00: Analog operating point is at start of AD-range, only positive signals are convertible 01: Analog operating point is in the middle of AD-range, positive and negative signals are convertible 11: Analog operating point is at end of AD-range, only negative signals are convertible
2	OPCTLH	Operating point control high	0	10=01
3	MA0	Multiplexer address 0	0	-not used- write '0' to this location
4	MA1	Multiplexer address 1	0	-not used- write '0' to this location
5	MA2	Multiplexer address 2	0	-not used- write '0' to this location
6	MA3	Multiplexer address 3	0	-not used- write '0' to this location
7	MA4	Multiplexer address 4	0	-not used- write '0' to this location
8	MA5	Multiplexer address 5	0	-not used- write '0' to this location
9	MA6	Multiplexer address 6	0	-not used- write '0' to this location
10	AIM	Automatic increment mode	1	1 : auto increment mode 0: manual mode (not used)
11	AMPL	Amplification high bit	0	0: low amplification 1: high amplification
12		spare	0	-not used- write '0' to this location
13		spare	0	-not used- write '0' to this location
14		spare	0	-not used- write '0' to this location
15	BDUR	Break Duration	0	0: 64clks of MCLK 1: 32clks of MCLK

**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)

# Specifications for Thermopilearrays

## HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



### Internal Register Map 32x31:

Num	Name	Function	Default	Notes
0	R	Reset	0	In case of 1, the mux pixel counter is reset. ASIC stays in reset.
1		spare	1	-not used- write '1' to this location
2		spare	0	-not used- write '0' to this location
3	MA0	Multiplexer address 0	0	-not used- write '0' to this location
4	MA1	Multiplexer address 1	0	-not used- write '0' to this location
5	MA2	Multiplexer address 2	0	-not used- write '0' to this location
6	MA3	Multiplexer address 3	0	-not used- write '0' to this location
7	MA4	Multiplexer address 4	0	-not used- write '0' to this location
8	MA5	Multiplexer address 5	0	-not used- write '0' to this location
9	MA6	Multiplexer address 6	0	-not used- write '0' to this location
10	AIM	Automatic increment mode	1	1 : auto increment mode 0: manual mode (not used)
11	AMPL	Amplification high bit	0	0: low amplification 1: high amplification
12		spare	0	-not used- write '0' to this location
13		spare	0	-not used- write '0' to this location
14		spare	0	-not used- write '0' to this location
15	BDUR	Break Duration	0	0: 64clks of MCLK 1: 32clks of MCLK

**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)

# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



## Characteristics:

### Common Specifications:

- |                              |  |
|------------------------------|--|
| • Number of Thermocouples    | 80                                       |
| • Technology                 | n-poly/p-poly Si                         |
| • Element Resistance         | approx. 80 kOhms                         |
| • Sensitivity                | approx. 60 V/W without optics and filter |
| • Thermal Pixeltime constant | <4 ms                                    |
| • MUX preamplifier noise     | approx. 30 nV/ $\sqrt{\text{Hz}}$        |
| • Digital Interface          | SPI                                      |
| • Analog Output              | Yes                                      |
| • 2 point selectable Gains   | 2640x / 7920 x                           |

### Array-dependent Specifications:

#### 8x8 elements:

- Pitch 300  $\mu\text{m}$
- Absorber size 220  $\mu\text{m}$
- Max. Framerate 66,8 Hz  
(without Averaging)
- 4 internal Amps + MUX
- 64 sensitive elements
- Internal ADC 12 bit

FOV(L=3mm)= 44 deg  
FOV(L=4mm)= 33 deg  
FOV(L=7mm)= 20 deg

#### 16x16 elements:

- Pitch 220  $\mu\text{m}$
- Absorber size 150  $\mu\text{m}$
- Max. Framerate 17,7 Hz  
(without Averaging)
- 8 internal Amps + MUX
- 256 sensitive elements
- Internal ADC 12 bit

FOV(L=3mm)= 61 deg  
FOV(L=4mm)= 48 deg  
FOV(L=7mm)= 28 deg

#### 32x31 elements:

- Pitch 220  $\mu\text{m}$
- Absorber size 150  $\mu\text{m}$
- Max. Framerate 9,1 Hz \*  
(without Averaging)
- 16 internal Amps + MUX
- 992 sensitive elements
- Internal ADC none

FOV(L=7mm)= 53 x 52 deg  
FOV(L=10mm)= 39 x 38deg

L equals the focal length of the lens.

\*) Framerates up to approx. 20 Hz are possible, but not approved yet.

**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)

# Specifications for Thermopilearrays

## HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



### Electric Specifications:

#### Absolute Maximum Ratings:

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V <sub>CC</sub>		-0.5		6	V
Voltage at All inputs and outputs	V <sub>IO</sub>		-0.5		V <sub>CC</sub> +0.5	V
Storage Temperature	T <sub>STG</sub>		-30		125	Deg. C

#### Operating Conditions:

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V <sub>CC</sub>		4.5		5.5	V
Operation Temperature	T <sub>A</sub>		0		85	Deg. C
ESD-Protection		Human body model	1.5			kV
		100pF + 1k50hm				

#### Electrical Characteristics

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
-----------	--------	-----------	------	------	------	------

##### Digital Input

Frequency of MCLK	MCLK			1M	TBD	Hz
Input voltage high	V <sub>IH</sub>		V <sub>DD</sub> -1.2			V
Input voltage low	V <sub>IL</sub>				1.2	V
Operating Frequency	f <sub>OP</sub>	CLK_1MHz	500k	1M	TBD	Hz

##### PTAT

Temperature range			0		85	Deg. C
PTAT value@ -20°C				TBD		V
PTAT value@100°C				TBD		V

##### Signal Processing

First amplifier stage gain	G0		TBD	880	TBD	V/V
Second amplifier stage gain	G1	AMPL=0	TBD	3	TBD	V/V
Second amplifier stage gain	G1	AMPL=1	TBD	9	TBD	V/V
Analog path Output ripple	V <sub>PPSENS</sub>		-	-	TBD	mV
Temp. coefficient Thermopile path output voltage	TC <sub>OUTA</sub>		TBD	-	TBD	mV/K

##### VoltageReference

VREF_1225	V <sub>REF</sub>	V <sub>CC</sub> =5V, T <sub>amb</sub> =25°C	1.2	1.225	1.25	V
Temp. coeff. of V <sub>REF</sub>	TC <sub>REF</sub>		TBD		TBD	ppm/K

HEIMANN Sensor GmbH  
Grenzstr. 22  
D-01109 Dresden / Germany

Contact / Customer Support  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

Internet  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)

# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



## Electrical Characteristics (continued)

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
-----------	--------	-----------	------	------	------	------

### Analog Output

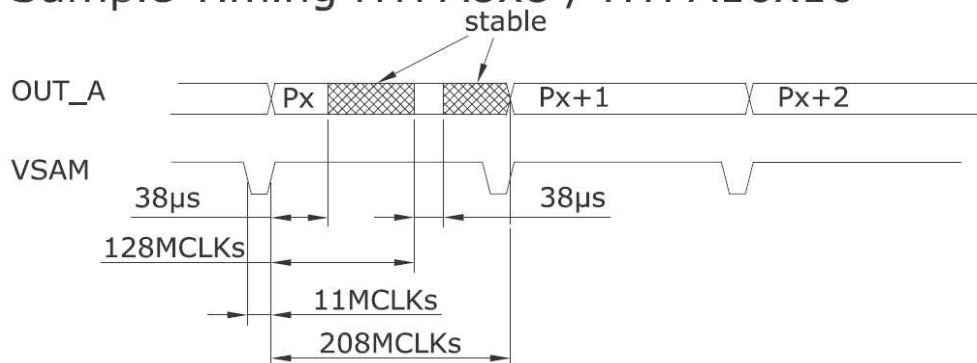
Output voltage swing	$V_{OUTA}$	load 10kOhm	0.5		$V_{CC}-0.8$	V
Power supply rejection ratio	$P_{SRR}$	AMPL=1	TBD			dB
Output current limit	$I_{OUTA}$	OUT_A	0.15			mA

### General Parameters

Overall current consumption	$I_{DD}$	CLK_1MHz=1MHz		7	TBD	mA
Start up time	$T_{POR}$	CLK_1MHz=1MHz Power On to first sample			TBD	mS

## Timings HTPA8x8 and HTPA16x16:

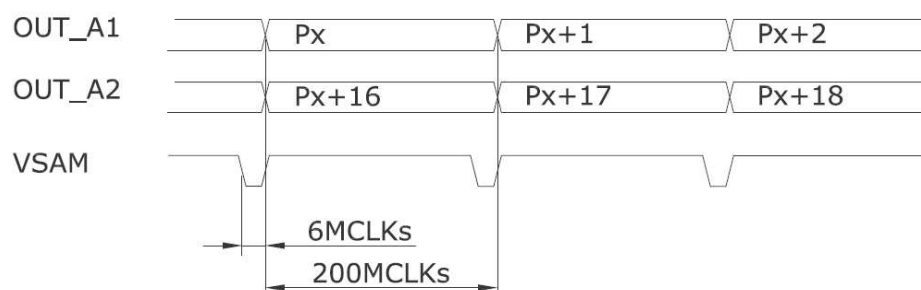
### Sample Timing HTPA8x8 / HTPA16x16



For the HTPA 8x8 and the HTPA 16x16 every analogous voltage has 2 stable domains, as shown above.

## Timings HTPA32x31:

### Sample Timing HTPA32x31



For the HTPA32x31 every analogous voltage is stable in the whole time domain.

**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)

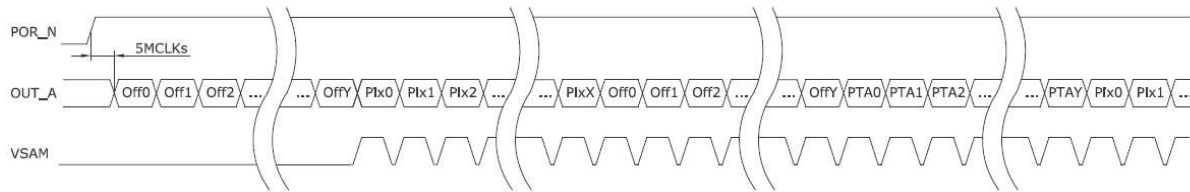
# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



## Serial Transmission:

HTPA8x8 / HTPA16x16 Serial Transmission of analogue data



Off0...OffY            Electric offset of amplifier 0 to amplifier Y  
 Pix0...PixX            Amplified pixel voltage of Pixel0 to PixelX  
 PTA0...PTAY           PTAT-Signal ((Y+1)-times)

Constants for array types:

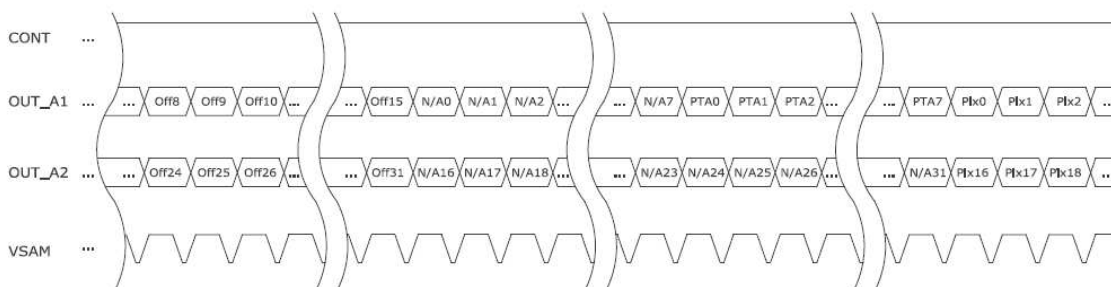
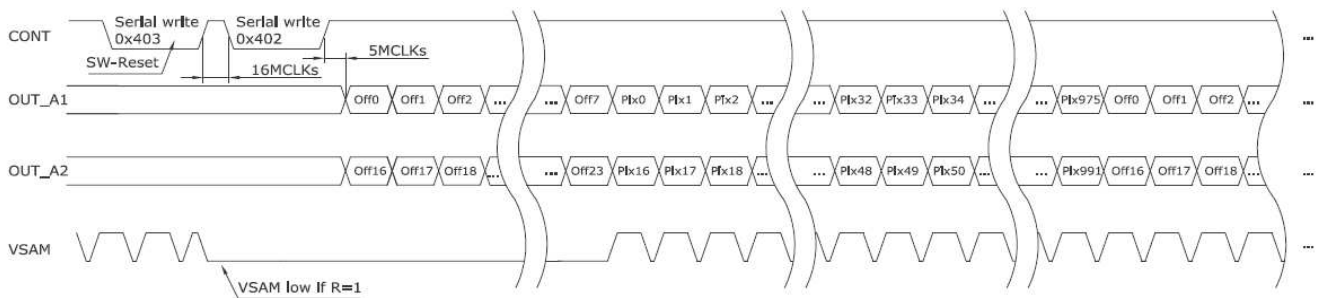
Type 8x8:

Y=3  
 X=63

Type 16x16:

Y=7  
 X=255

HTPA32x31 Serial Transmission of analogue data



The numeration of the pixels is in all cases line by line.

**HEIMANN Sensor GmbH**  
 Grenzstr. 22  
 D-01109 Dresden / Germany

**Contact / Customer Support**  
 Phone 49 (0) 6123 60 50 30  
 Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
 mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)



# Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.12: 2010.08.03 Fg



## SPI Communication:

Data sampled at rising edge of SCLK, MSB first.

In case of ASIC as master device the frequency of the SCLK\_IO is equal to the frequency of MCLK/2.

HTPA8x8 & HTPA16x16:

The four MSB's signify the row address of the current pixel, the other bits describe the ADC-result.

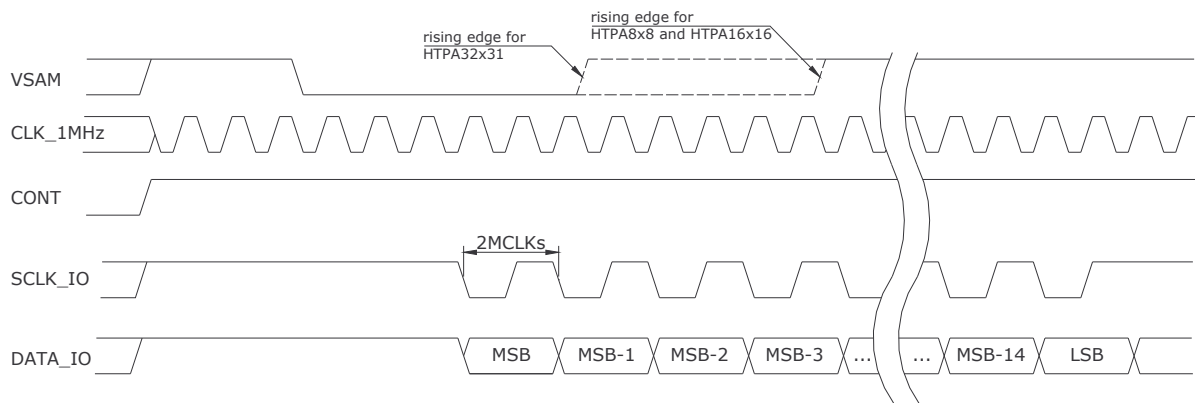
HTPA 32x31:

The valid sample cycle numbers are expensed in the least 10 bits. The value runs from 0 to 527.

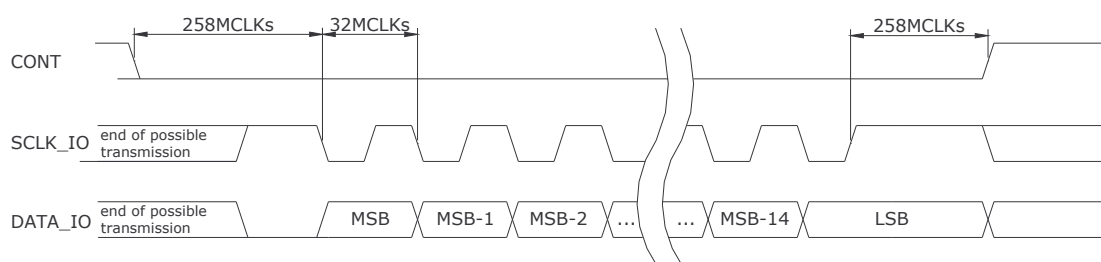
The output drivers for SCLK\_IO and DATA\_IO are enabled by CONT.

If CONT is low the data can be written serially from external controller through DATA\_IO. In that case the external controller has to wait a minimum delay time, until SCLK\_IO and DATA\_IO output drivers are disabled. After programming, the positive slope of CONT stores the contents, when the number of SCLK-pulses is equal 16. While the output driver of the ASIC is disabled a weak pull up ensures that the SCLK\_IO pin is at high level. To execute a reset command, the  $\mu$ C has to write a logical "1" to the R-Bit in to configuration and afterwards a "0" into the R-bit, which requires two write cycles in this special case.

### Serial Read from ASIC



### Serial Write to ASIC



**HEIMANN Sensor GmbH**  
Grenzstr. 22  
D-01109 Dresden / Germany

**Contact / Customer Support**  
Phone 49 (0) 6123 60 50 30  
Fax 49 (0) 6123 60 50 39

**Internet**  
[www.heimannsensor.com](http://www.heimannsensor.com)  
mail: [info@heimannsensor.com](mailto:info@heimannsensor.com)