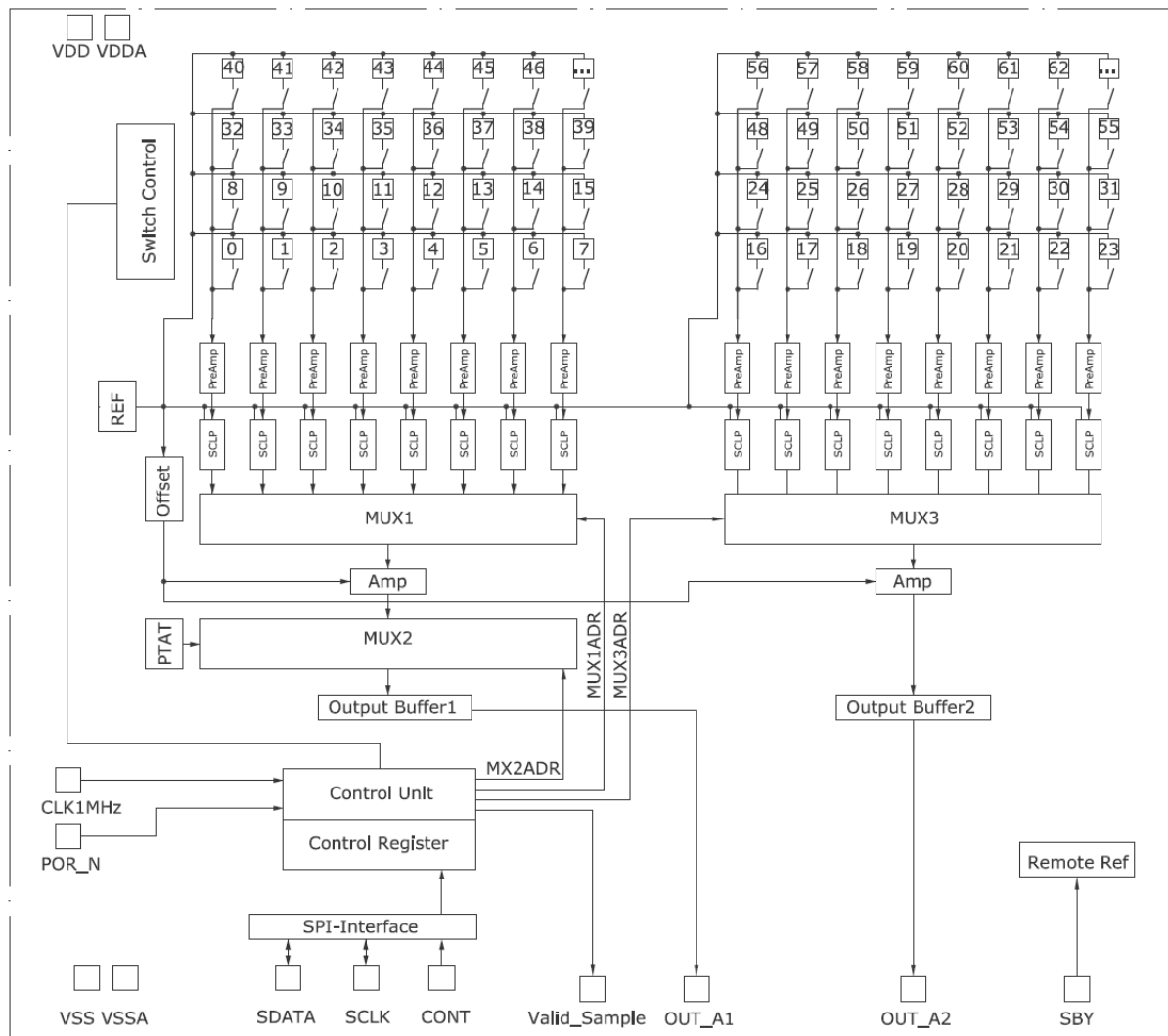


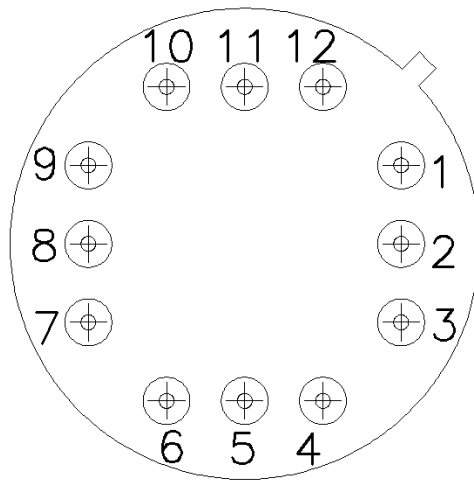
**This datasheet is valid for following parts:**

**HTPA32x31L4.7/0.9HiS**  
**HTPA32x31L4.7/0.9S**

**Principal Schematic for HTPA32x31:**



## Pin Assignment in TO8 – Bottom View:



Connect all reference voltages via 100 nF capacitors to VSS.

Pin Assignment 32x31			
Pin	Name	Description	Type
1	MCLK	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.

**Internal Register Map:**

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

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## Order Code Example

HTPA32x31	L10 / 0.8	F8-14	Hi	M	(SPI)	[Si]	
							<b>Type:</b> HTPA32x31 Please contact support for all available HTPA and module combinations.
							<b>Output:</b> d Not declared HTPA sensor with digital output HTPA sensor with analogous output
							<b>Optics:</b> L / Focal length: In example L2,1 = 2,1 mm focal length F-Number: In example /0.85 For optics see also “HTPA standard optics”
							<b>Filter:</b> F Not declared Filter characteristics. In example F8-14 (μm, Bandpass) Broad band ARC
							<b>Sensitivity:</b> Hi Not declared Increased sensitivity Standard sensitivity
							<b>Version:</b> A Always UDP Interface. M Module: HTPA sensor soldered to PCB, calibrated stream S HTPA sensor only. Raw voltage output, not calibrated
							<b>Interface:</b> SPI SPI device; Two variants: Analog HTPA, 14bit ADC Digital HTPA, 12bit ADC LC SPI,Only Analogous HTPA. low speed, external processing required UDP Ethernet, CAT5 cable connection
							<b>Lens Material:</b> Si Not declared Silicon Germanium

## Characteristics:

### Common Specifications:

Technology	n-poly/p-poly Si
Element Resistance	approx. 80 kOhms
Sensitivity	approx. 100 V/W without optics and filter
Thermal pixel time constant	<4 ms
MUX preamplifier noise	approx. 30 nV/ $\sqrt{\text{Hz}}$
Pixel + amplifier noise	approx. 50 nV/ $\sqrt{\text{Hz}}$
Digital Interface	SPI
Analog Output	Yes
2 point selectable Gains	880x / 2640 x

Pitch	220 $\mu\text{m}$
Absorber size	150 $\mu\text{m}$
Max. Framerate	25 Hz
(without Averaging)	
16 internal Amps + MUX	
992 sensitive elements	

### Optical characteristics:

Focal length:	4.7 mm ("L" equals the focal length of the lens)
F-Number:	0.9
Field of view:	91 x 88 deg
Lens coating:	AR-Coating; average reflectance per surface < 3% for $8\mu\text{m} < \lambda < 11.5 \mu\text{m}$ Environment acc. for MIL-C-48497

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## Electric Specifications:

### Absolute Maximum Ratings:

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V <sub>DD</sub>		-0.5		6	V
Voltage at All inputs and outputs	V <sub>IO</sub>		-0.5		V <sub>DD</sub> +0.5	V
Storage Temperature	T <sub>STG</sub>		-20		85	Deg. C

### Operating Conditions:

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V <sub>DD</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
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#### Digital Input

Frequency of MCLK	MCLK		100k	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

#### PTAT

Temperature range			0		85	Deg. C
PTAT gradient			37.4	39.1	40.5	K/V

#### Signal Processing

First amplifier stage gain	G0		TBD	880	TBD	V/V
Second amplifier stage gain	G1	AMPL=0	TBD	1	TBD	V/V
Second amplifier stage gain	G1	AMPL=1	TBD	3	TBD	V/V
Analog path 1 Output ripple	V <sub>PPSENS</sub>	AMPL=0 MCLK=1MHz	16	18	22	mV
Analog path 2 Output ripple	V <sub>PPSENS</sub>	AMPL=0 MCLK=1MHz	64	69	74	mV
Temp. coefficient Thermopile path output voltage	TCO <sub>OUTA</sub>		-0.07	0.02	0.10	mV/K

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## Electrical Characteristics (continued)

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
VoltageReference						
VREF_1225	V <sub>REF</sub>	V <sub>dd</sub> =5V, T <sub>amb</sub> =25°C SBY=1	1.31	1.32	1.34	V
Temp. coeff. of V <sub>REF</sub>	TC <sub>REF</sub>		41	128	217	ppm/K

## Analog Output

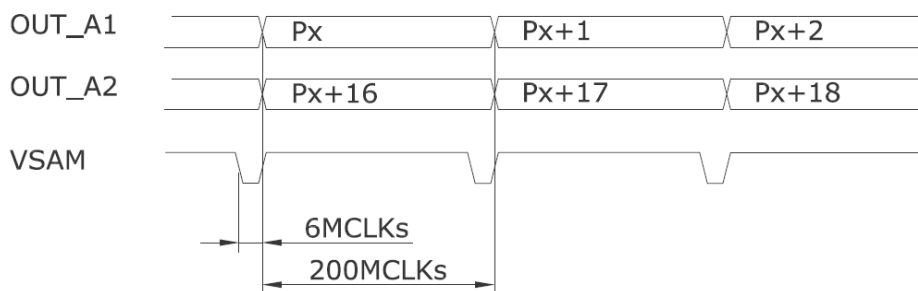
Output voltage swing	V <sub>OUTA</sub>	load 10kOhm	0.5		V <sub>DD</sub> -0.8	V
Power supply rejection ratio	P <sub>SRR</sub>	AMPL=0, VDD<5V MCLK=1MHz	-14.5	-13.8	-13.3	dB
Output current limit	I <sub>OUTA</sub>	OUT_A	0.15			mA

## General Parameters

Overall current consumption	I <sub>DD</sub>	MCLK=1MHz 25° C	7.1	7.4	8.2	mA
Start up time	T <sub>POR</sub>	Power On to first VSAM transition		1610		cycles

## Timings HTPA32x31:

### Sample Timing HTPA32x31



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

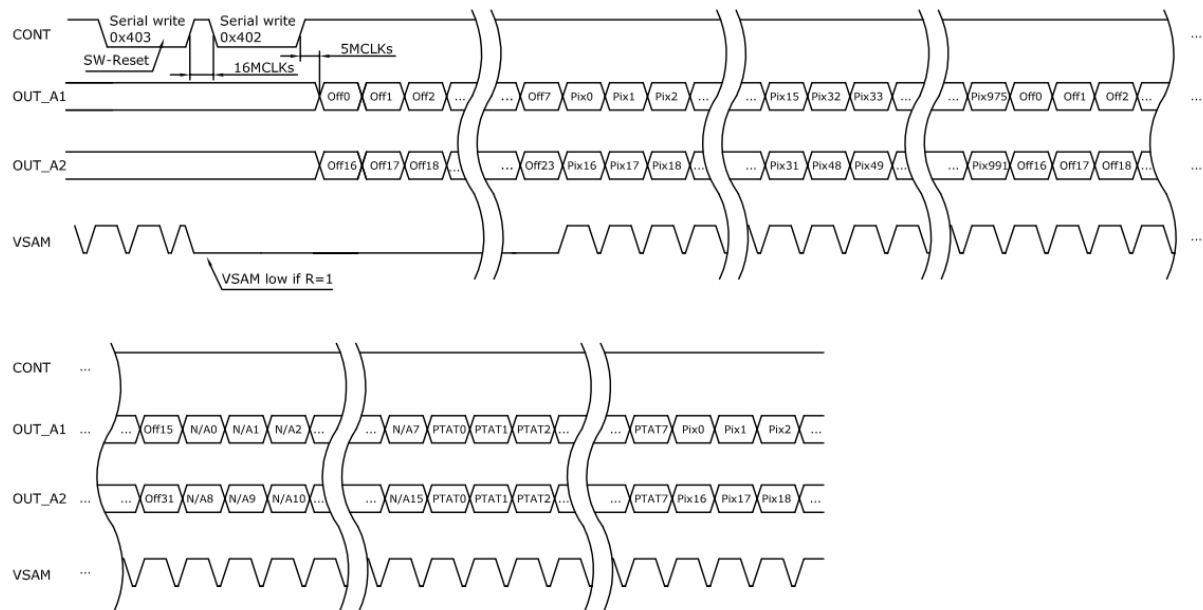
# HTPA32x31L4.7/0.9HiS

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## Serial Transmission:

HTPA32x31 Serial Transmission of analogue data



Off0...Off16      Electric offset of amplifier 0 to amplifier 16  
Pix0...Pix991      Amplified pixel voltage of Pixel0 to Pixel991  
PTAT0...PTAT7      PTAT-Signal

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



## 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.

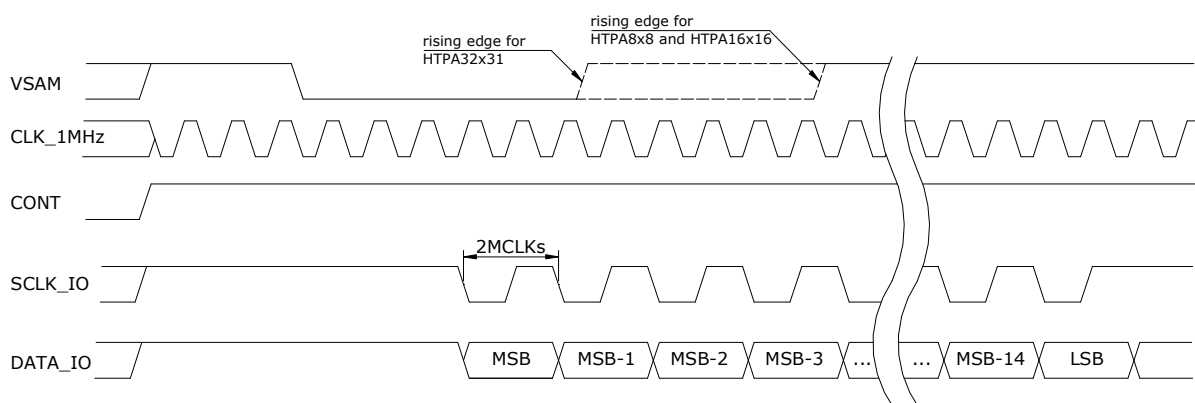
The valid sample cycle numbers are expensed in the least 10 bits. The value runs from 0 to 527.

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

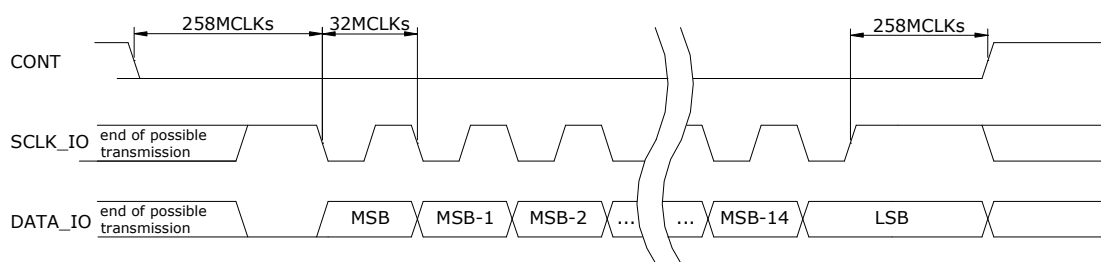
If CONT is low the data can be written serially from external controller through DATA\_IO.

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



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