

Boston Electronics Corporation

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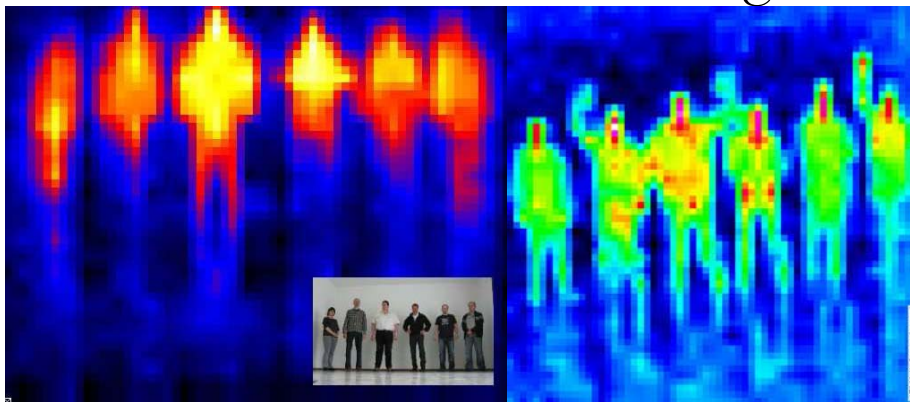
HEIMANN Sensor

Thermopile and Pyroelectric IR

Detector Arrays for Low Co\$

THERMAL IMAGING

and IR Line Sensing





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Thermopile Focal Planes from Heimann Sensor GmbH

Versions Available	Package	Application Set ¹ (fill, F.L. mm/F/#)	UDP Module ²	SPI Module ²	SPI Devel Kit ⁴	UART Module ²	Sensor Only ²
8x8	TO-39	\$1200 (N2, L5.5)	\$410	\$410 ³	\$1,150	\$410 ³	\$300 (N2)
16x16	TO-39	to be developed					
	TO-8	samples available BUT may be discontinued in favor of TO-39 version					
		NEW wide FOV lens (~75°)					
32x31		\$3000 (Xe, L4.7/0.9) "early bird" price					
		\$1950 (N2, L10/0.8)	\$1,150	\$1,150	\$1,900	\$1,150	\$980 (N2)
		\$2075 (Xe, L10/0.8)	\$1,300	\$1,300	\$2,025	\$1,300	\$1130 (Xe)
		\$1850 (N2, L10/1.0)	\$950	\$950	\$1,800	\$950	\$870 (N2)
		\$1980 (Xe, L10/1.0)	\$1,100	\$1,100	\$1,930	\$1,100	\$1040 (Xe)
64x62		\$1630 (N2, L7)	\$840	\$840	\$1,560	\$840	\$740 (N2)
		\$950 (N2, plane window) ^c					
		\$2500 (Xe, L20/0.95) "early bird" price					
	TO-8	\$2200 (Xe, L10/0.8) - ask us about suitability to your application, not ready for every task yet; UDP Module available					

Lens Options for TO-8 packages	
Focal Length (mm)	f/#, material
3 ^a	<1.0, Ge
4 ^a	<1.0, Ge
4.7	0.9, Ge dual
7 ^b	0.7, Ge
10	0.8, Ge dual
	1.0, Ge dual
20	0.95, Ge

^a = 8x8 and 16x16 only
^b = not recommended
^c = min order 5

1 = Application Set is operational camera with software, requires WinTel computer for control, display
2 = minimum qty 5
3 = in development
4 = includes one SPI-module

Lens Options for TO-39 packages	
Focal Length (mm)	f/#, material
3	<1.0, Ge
5.5	1.0, Si uncoated
7	1.0, Ge
	1.0, Si

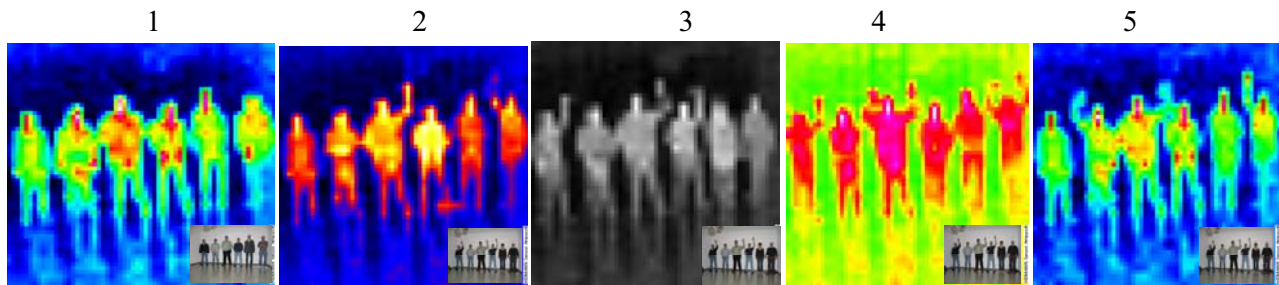
Prices subject to change without notice. Prices are FOB Brookline MA USA and do not include shipping

Thermal Images with 32x31 Array Modules

a) Person detection:

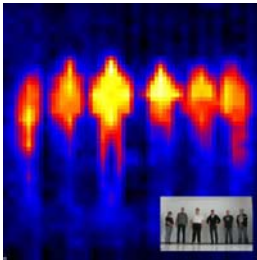
32x31 Array with high performance (multi lens optics)

– difference 1...5 is only various false colour modes of quick start kit:

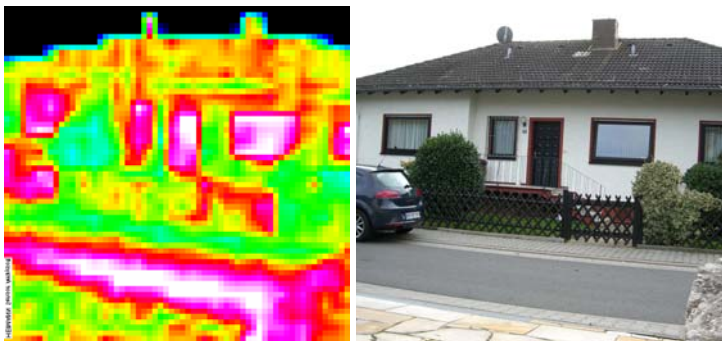


b) Person detection - Low cost option: 32x31 Array with single Ge lens $f=7$ mm

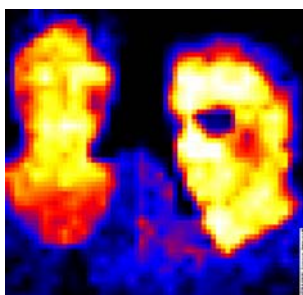
- Colour mode is same as Number 2 with multi lens



c) Building Thermography (32x31 Array with multi lens optics):



d) Fever detection (32x31 Array with multi lens optics):





Quick Start Application Set

For thermal imaging and easy application of our arrays we designed an evaluating processor unit in a modular metal case for better handling. The module's field of view depends on housing, the built-in lens and can be varied on demand.

The object temperature range can be easily changed by software.

The digital data stream is transferred from the module to the PCB via SPI and contains the signal voltages of the elements, the offset of the amplifiers and the ambient temperature information of the module. The analogous data stream contains the same information and can be sampled by an external ADC. The microcontroller processes the data and communicates via Ethernet/UDP to a PC. On PC side the data stream is logged and visualized with a Graphical User Interface. The given software allows you to start your measurements and testing almost immediately.

Applications

- Person detection
- Fire detection
- Hotspot detection
- Energy management
- Security cameras
- Industrial process control
- Air condition control
- Out of position

Benefit

- Low cost TO8/TO39 housing
- Low power consumption
- Short time constant
- High sensitivity of the system
- No need for shutter and thermal stabilization

Features:

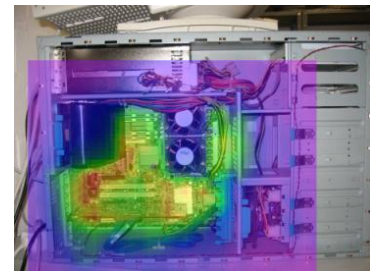
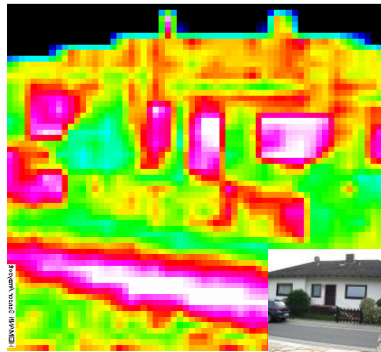
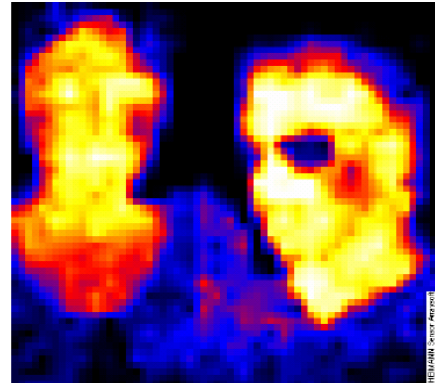
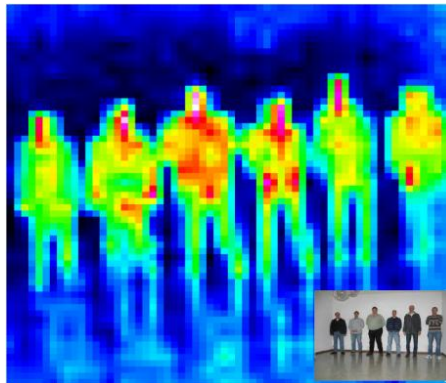
- Communications via RJ45/Ethernet/UDP
- False color images with auto scaling
- Selectable frame rate
- Data log mode
- Contrast adjustment
- Interpolation
- Temperature display
- Several lenses for different field of view

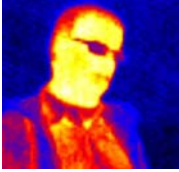
Included in delivery:

- Array module
- Cable interface
- AC adapter (100V~ ... 240V~)
- Tripod
- Software

Module dimension:

- Diameter 28 mm; length approx. 55 mm (length depends on chosen lens)

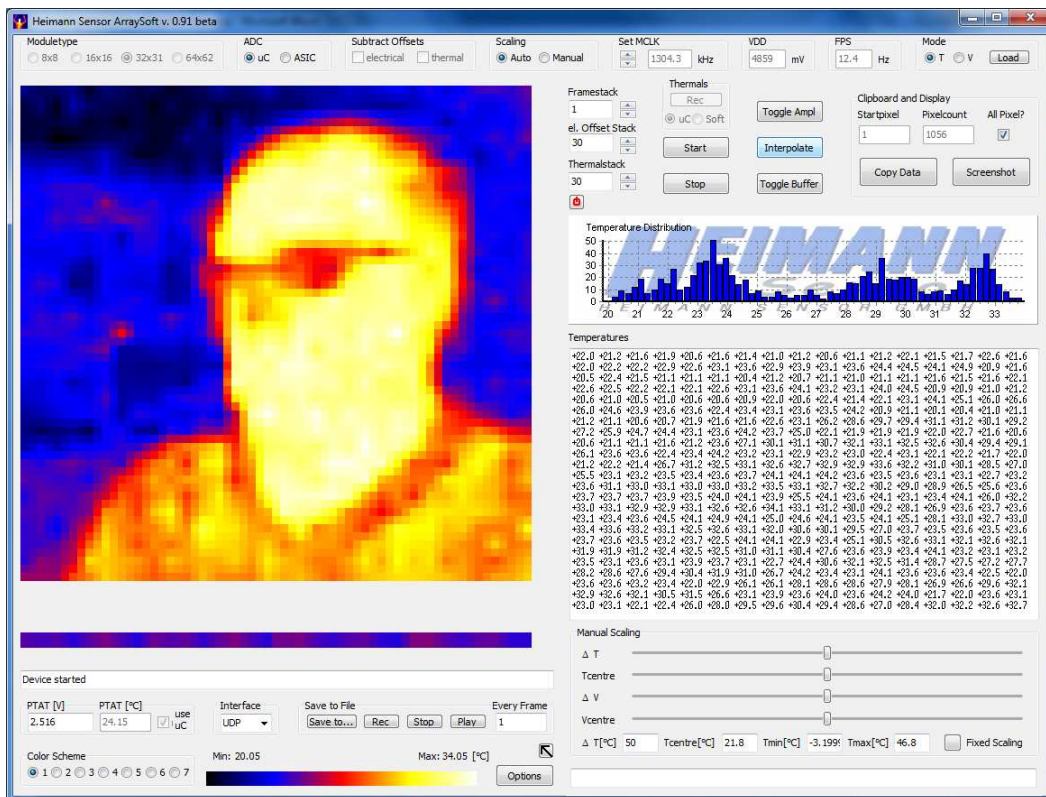




Heimann Sensor ArraySoft

Graphical User Interface for HTPA Modules and Application sets

The HTPA application set comes with our comprehensive Graphical User Interface (GUI) "ArraySoft" which provides a lot of features and is constantly updated. It can be used instantly with our UDP-Modules, SPI-SDK for the HTPA series and our application sets. Furthermore, it is possible to use it with our UART modules by connecting the module via a transceiver to the RS232 interface of your PC.



Features:

- 7 false color scales
- Auto and manual scaling (7 scaling modes)
- Temperature and voltage mode
- Data streaming into files
- AVI export
- Interpolation mode
- Complete control of the device
- Multiple devices can be controlled
- The data stream of 4 devices can be displayed at the same time
- Histogram
- Selectable temperature or voltage profile
- Minimum and Maximum Temperature / Voltage info
- Suitable for all HTPA types (8x8 to 64x62)
- Frames per second indicator
- Alignment for offset corrected frames
- Temperatures in Kelvin or degree Celsius
- IR-Frame can be mirrored in both axis
- Single Pixel information accessible
- Temperature calculation with the respect to object emissivity
- Screenshot ability (JPG or ASCII data)
- Recorded data streams can be played in selectable speed
→ Make your own "thermal movie"

Modifications reserved Rev.0 04.02.2011

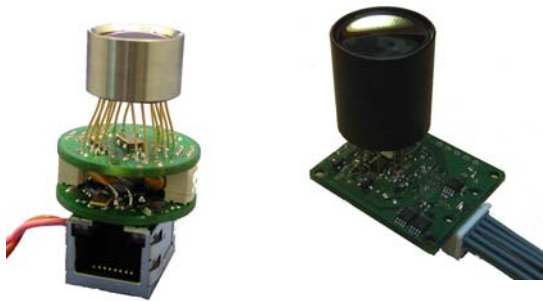


HTPA Modules

For easy development of thermal imaging, hotspot detection, person detection and other thermo graphical devices our calibrated modules are the ideal solution. We provide them for all the HTPA types (8x8, 16x16, 32x31 and 64x62). The module's field of view depends on the optics and can be varied on demand.

Furthermore, we offer three different interfaces: UDP, UART and SPI. Which interface should be chosen, depends on the needs of the customer. For example, the UDP module is ready to plug via a CAT5 cable to network and can be controlled via a customized software or the Heimann Sensor HTPA ArraySoft. The UART module is the ideal solution for embedding the module i.e. in handheld devices. Limitations of the UART interface are the limited MCLK frequency of max. 2.2 MHz. It is possible to connect the UART module to a standard RS232 transceiver and to use it with the Heimann GUI (Graphical User Interface). If the customer wants to connect more than one module (or a module with MCLK > 2.2 MHz) to a microcontroller, the SPI interface should be chosen. For the SPI version there is our SDK available, which also transfers the fetched SPI data to the GUI via Ethernet.

It is possible to build customer specific optics, as well as to use customer specific measurement ranges for calibration.



Module dimension:

- UDP Module: Diameter 26mm
(circular PCB, rectangular PCB will be available soon)
- SPI / UART Module: 28x35 mm²

Benefit:

- Different optics available
- Calibrated, ready to assemble

SPI Module SDK

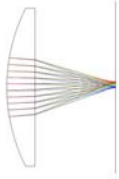
Since the controlling of the HTPA SPI module is much more complicated than the other versions, we offer a SDK (Software Development Kit) for this module type. The SDK was designed to do all the necessary settings of the module, fetch single frames and data streams and forward them via UDP to the GUI. The program running on the SDK is open source and is delivered with the SDK. For development a programming tool from Microchip Technology is required (not included) as well as the MPLAB IDE (downloadable free of charge at www.microchip.com). The SDK has several test pads and LED's for easy debugging. Furthermore, it is equipped with a 128kbit EEPROM. The circuitry of the SDK PCB is supplied, too.



Benefits:

- Fast development
- Workspace and circuitry can be easily adapted for the control of several modules
- Fully compatible designed to Heimanns GUI

Disclaimer: MPLAB IDE is a registered trade mark of Microchip Technology Inc.



HTPA Series Standard Optics

Heimann Sensor offers several kind of standard optics. We offer high performance dual germanium lens optics, as well as low cost uncoated, single silicon lenses. Naturally, it is possible to create new solutions, which fit to the individual needs of the customer.

Possible Combinations						
Lens	HTPA8x8 TO39	HTPA8x8 TO8	HTPA16x16	HTPA32x31	HTPA64x62	Remarks
L3	X	X	X	-	-	f/<1.0 Ge
L4	-	X	X	X	X	f/<1.0 Ge
L5.5	X	-	-	-	-	f/1.0 Si
L7/0.7	-	X	X	X	X	f/<1.0 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

Resulting Field of View [°]				
Lens	HTPA8x8	HTPA16x16	HTPA32x31	HTPA64x62
L3	43.6	60.8	-	-
L4	33.4	47.5	82.7	82.7
L5.5	24.6	-	-	-
L7	19.5	28.2	53.4	53.4
L10	13.7	20.0	38.8	38.8

The FOV can be easily calculated, according to the ray law:

$$FOV = 2 \cdot \arctan\left(\frac{N_{Col/Row} \cdot P}{2 \cdot f}\right)$$

f= focal length of the lens

P=Pitch of the sensitive elements

$N_{Col/Row}$ =Number of elements in Column or Row, depending if the FOV in horizontal or vertical direction should be calculated

Likewise, if the FOV is given, the needed focal length can be calculated by:

$$f = \frac{N_{Col/Row} \cdot P}{2 \cdot \tan\left(\frac{FOV}{2}\right)}$$



Modifications reserved Rev.1 07.02.2011

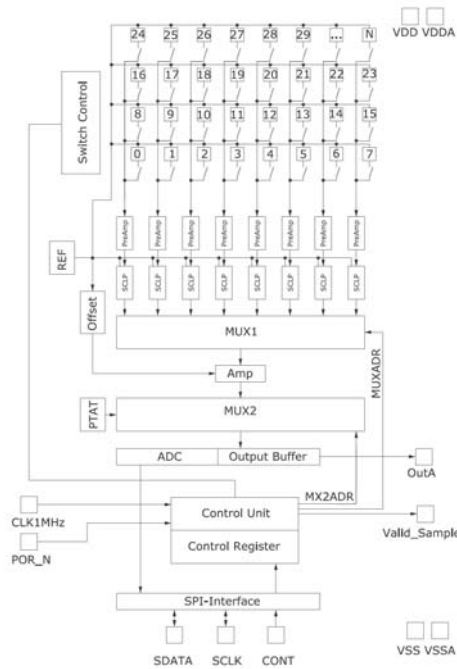


HTPA 8x8, 16x16, 32x31, 64x62 Thermopile Array with Ge-Lens

Heimann offers world new fully monolithic thermopile sensor arrays. This allows the measurement of temperature distribution of the environment, where very high resolutions are not necessary, such as person detection, surveillance of temperature critical surfaces, hotspot or fire detection, energy management and security applications. Other applications can be found in industrial process control and air condition control.

The benefits of this technology are low costs, the very small power consumption, small size, as well as the high sensitivity of the system. The larger arrays fit in a TO8 can and the 8x8 array even in a TO39 housing, which provides small dimensions and a reliable mechanical assy

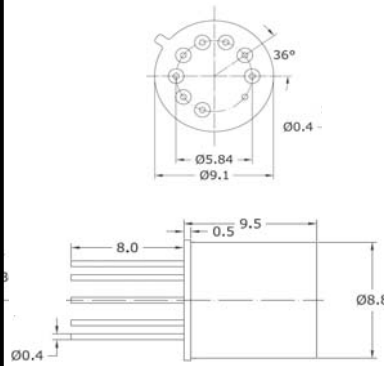
Principal Schematic:



The built-in lens can be varied (f=3mm, 4mm, 7mm or 10mm).

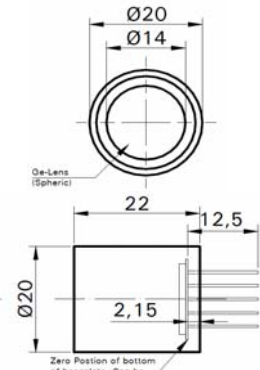
HTPA 8x8 L7 TO39

(single Ge-Lens, f=7mm)

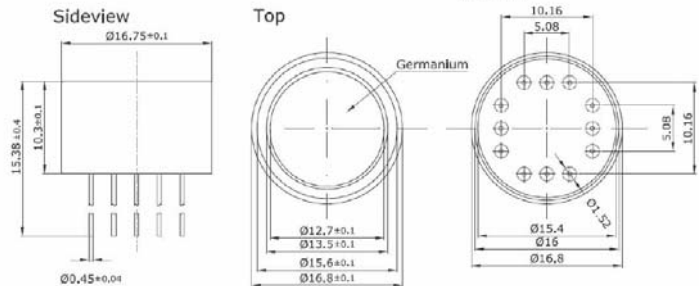


HTPA 32x31 L10 / HTPA 64x62 L10

(dual lens, f=10mm, f/# 1.0 or 0.8)



HTPA32x31L7 (single Ge-Lens, f=7mm)



HTPA series parameter overview					
Parameter	HTPA8x8	HTPA16x16	HTPA32x31	HTPA64x62	Unit
Technology	n-poly/p-poly Si	n-poly/p-poly Si	n-poly/p-poly Si	n-poly/p-poly Si	
Sensitivity (without optics/filter)	approx. 60	approx. 40	approx. 40	250...1500	V/W
NETD @1Hz and 100°C	<0.1	0,1	0,1	TBD	K
Total noise	70	50	50	50	nV/sqrt(Hz)
Pixel time constant	<4	<4	<4	5...80	ms
Internal ADC	12	12	/	/	bit
Interface type	SPI	SPI	SPI	SPI	
Analogous Out	Yes	Yes	Yes	Yes	
2 Point selectable gains	2640/7920x	2640/7920x	2640/7920x	2640/7920x	
Pitch	300	220	220	110	µm
Absorber size	220x220	150x150	150x150	60x60	µm²
Frames per second	70	20	>20	approx. 5-10	Hz
Supply voltage	5	5	5	5	V
Sensitive Elements	64	256	992	3968	

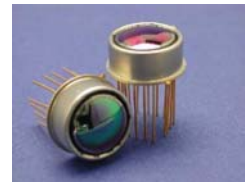
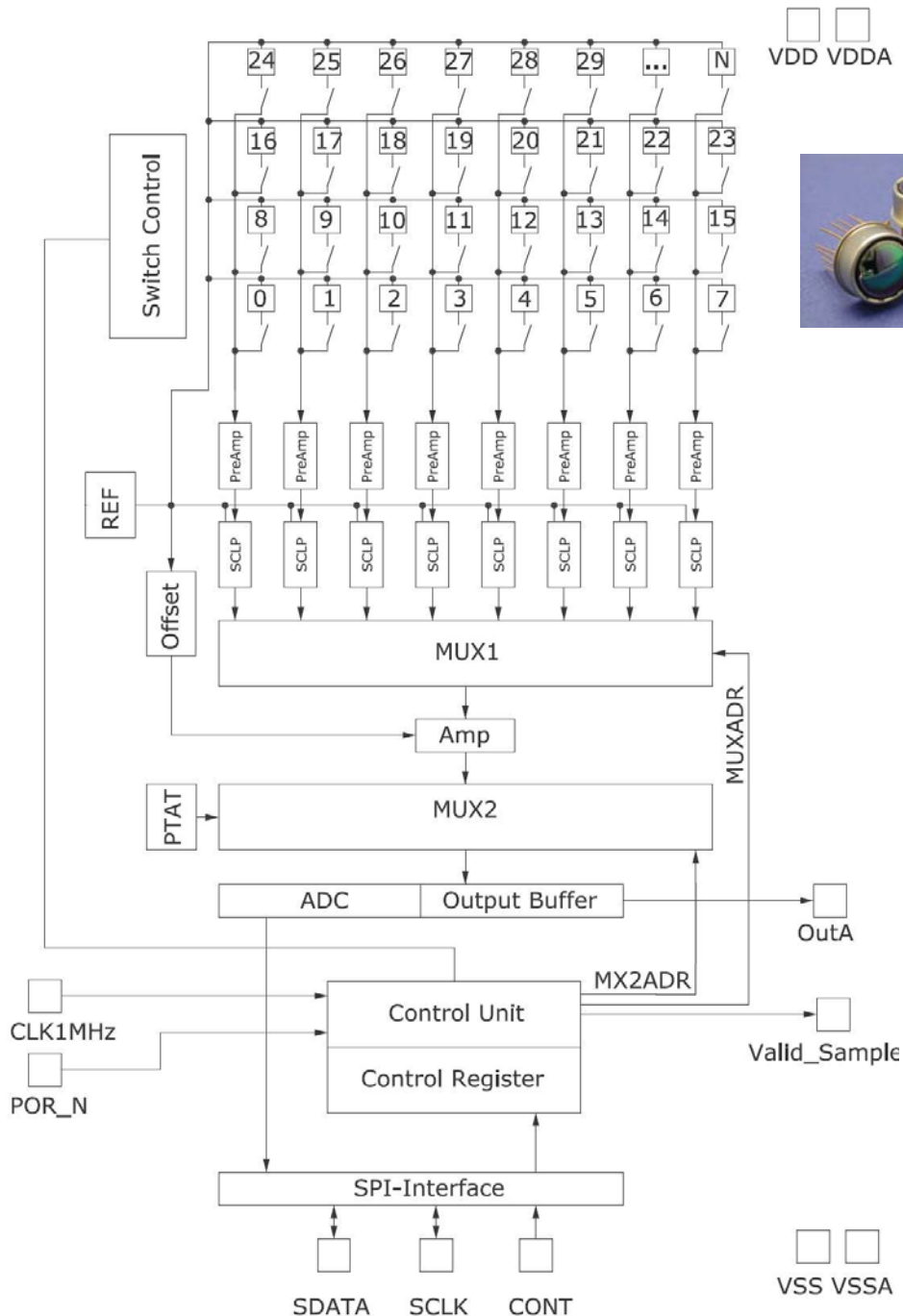
Modifications reserved Rev.03/ 12.05.2010

Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 Fg



Principal Schematic for HTPA16x16:



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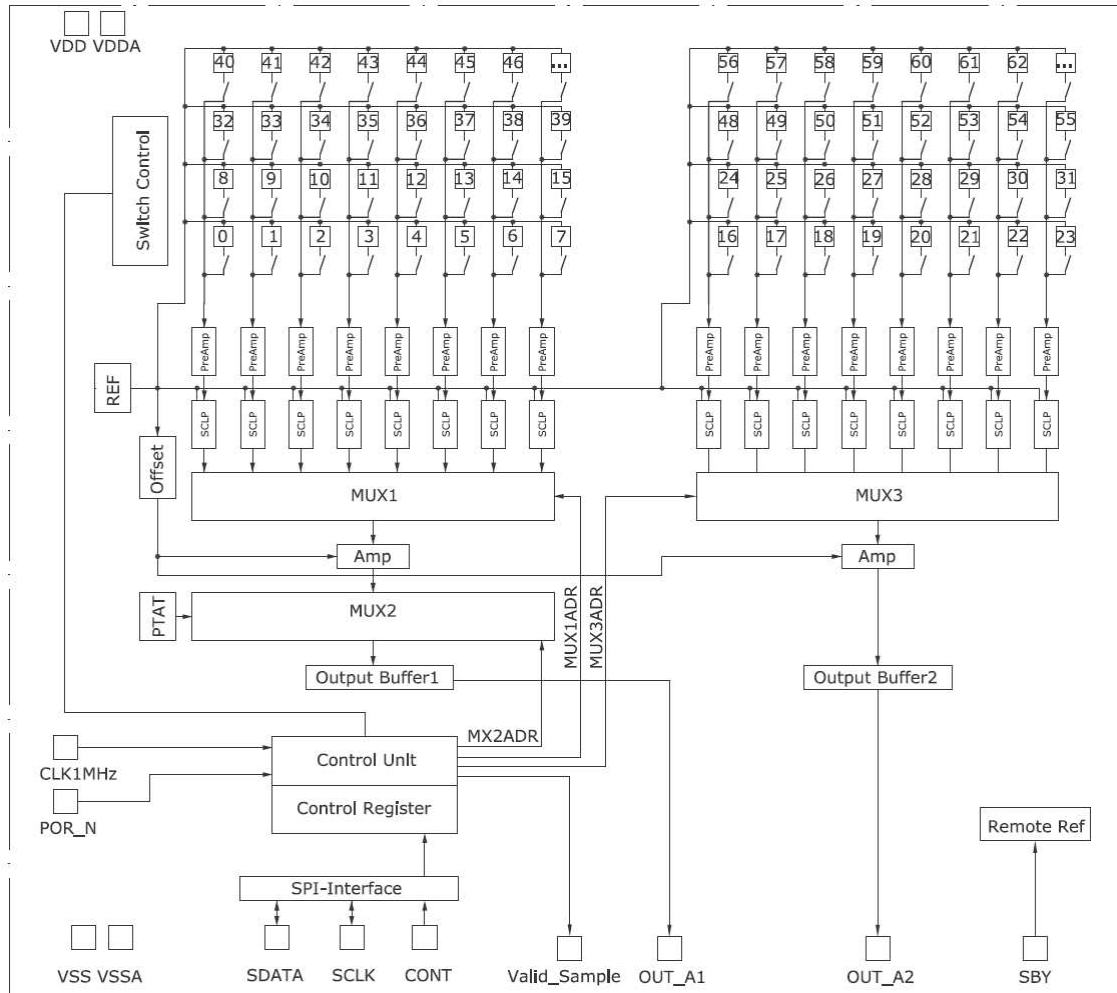
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Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 Fg



Principal Schematic for HTPA32x31:



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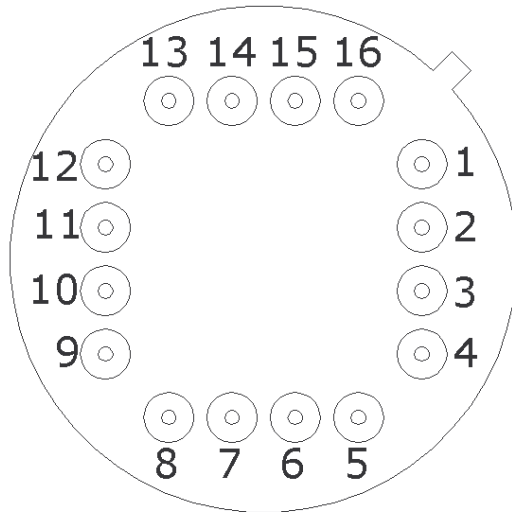
Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 Fg



Pin Assignment in TO8 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, negated	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

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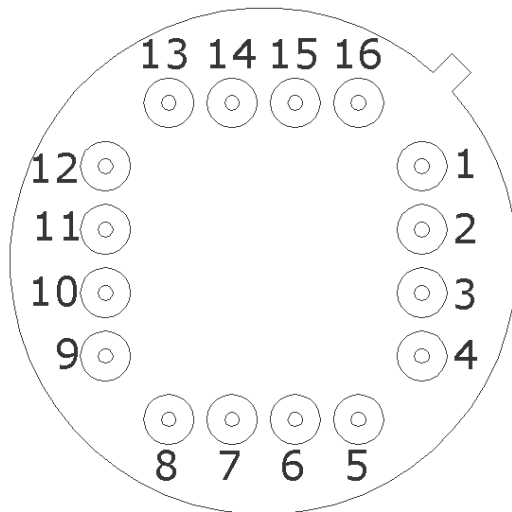
Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 Fg



Pin Assignment in TO8 for 16x16:

Bottom



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, negatived	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

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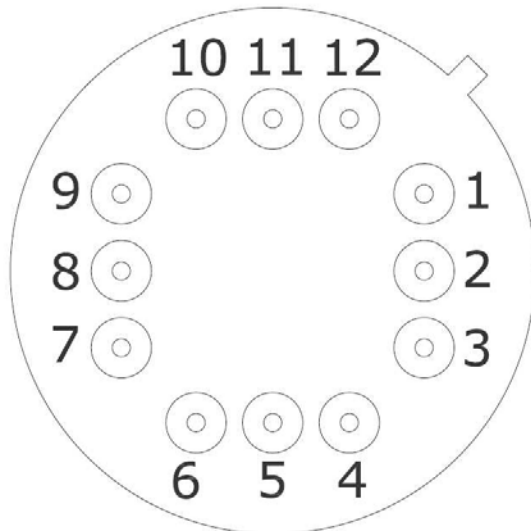
Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 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.

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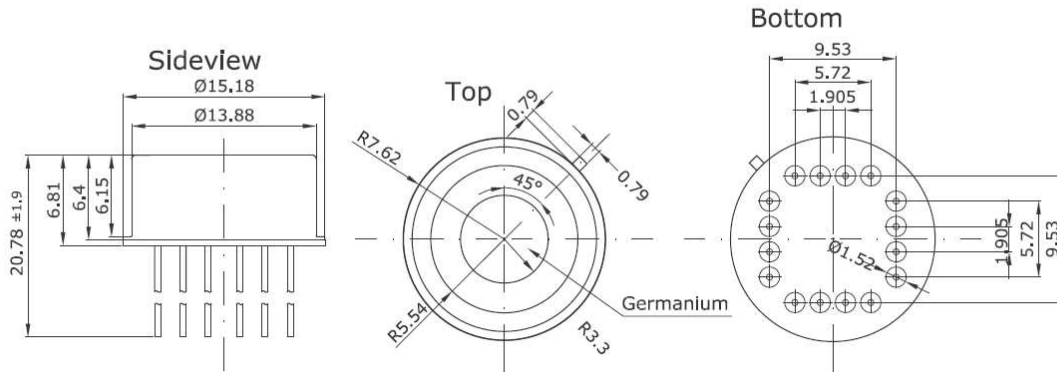
Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 Fg

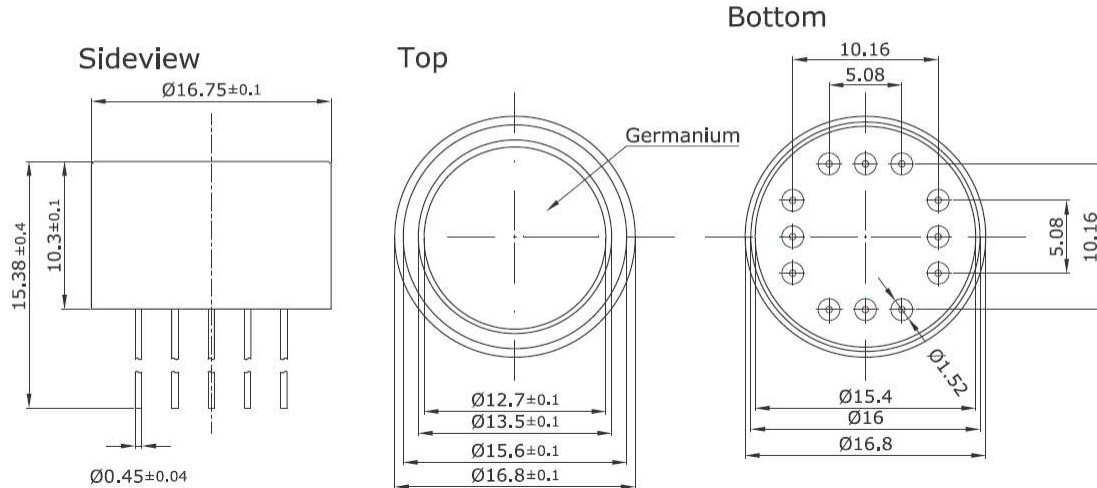


Outer Dimensions (continued):

HTPA8x8/HTPA16x16 with Ge-Lens L=3mm



HTPA32x31 with Ge-Lens L=7mm



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Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 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	OPCTL	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

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Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 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

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Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 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-depending Specifications:

8x8 elements:

- Pitch 300 μm
- Absorber size 220 μm
- 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 μm
- Absorber size 150 μm
- 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 μm
- Absorber size 150 μm
- Max. Framerate 9,1 Hz *
(without Averaging)
- 16 internal Amps + MUX
- 992 sensitive elements
- Internal ADC none

FOV(L=7mm)= 53 x 52 deg

L equals the focal length of the lens.

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

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Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 Fg



Electric Specifications:

Absolute Maximum Ratings:

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

Operating Conditions:

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{CC}		4.5		5.5	V
Operation Temperature	T _A		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			1M	TBD	Hz
Input voltage high	V _{IH}		V _{dd} -1.2			V
Input voltage low	V _{IL}				1.2	V
Operating Frequency	f _{OP}	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 _{PPSENS}		-	-	TBD	mV
Temp. coefficient Thermopile path output voltage	TCO _{OUTA}		TBD	-	TBD	mV/K

VoltageReference

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

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Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 Fg



Electrical Characteristics (continued)

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
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Analog Output

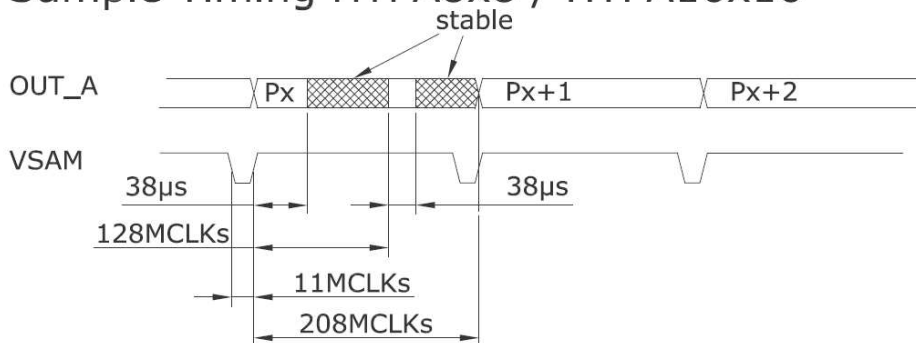
Output voltage swing	V_{OUTA}	load 10kOhm	0.5		$V_{CC}-0.8$	V
Power supply rejection ratio	P_{SRR}	AMPL=1	TBD			dB
Output current limit	I_{OUTA}	OUT_A	0.15			mA

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:

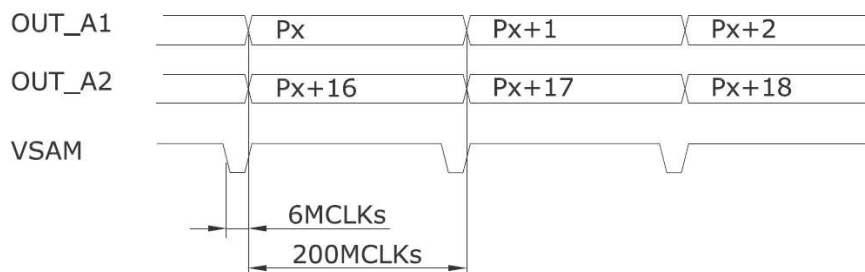
Sample Timing HTPA8x8 / HTPA16x16



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.

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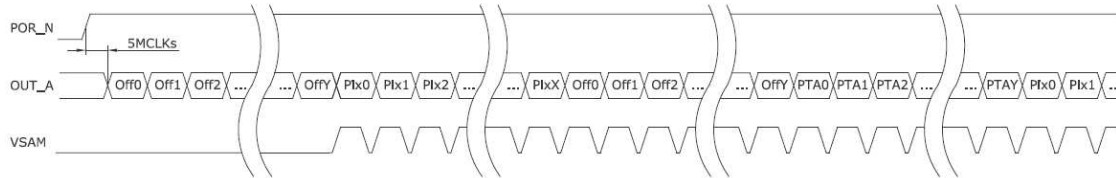
Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 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
 PTAY...PTAY PTAT-Signal ((Y+1)-times)

Constants for array types:

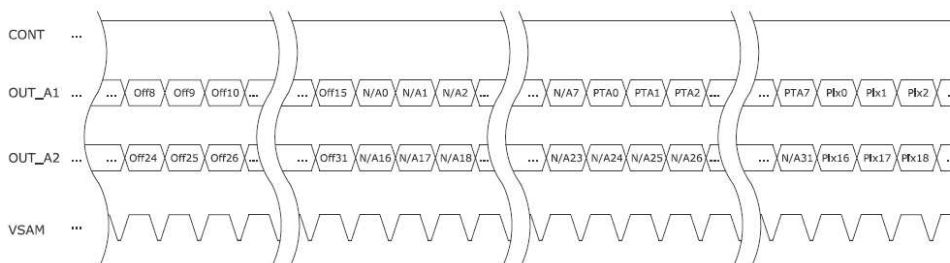
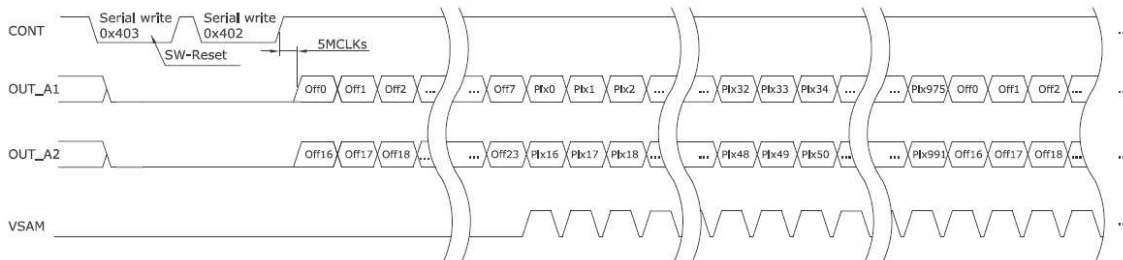
Type 8x8:

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.

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Specifications for Thermopilearrays HTPA8x8, HTPA16x16 and HTPA32x31

Rev.7: 2009.10.02 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 three MSB's signify the row address of the current pixel, the other bits describe the ADC-result.

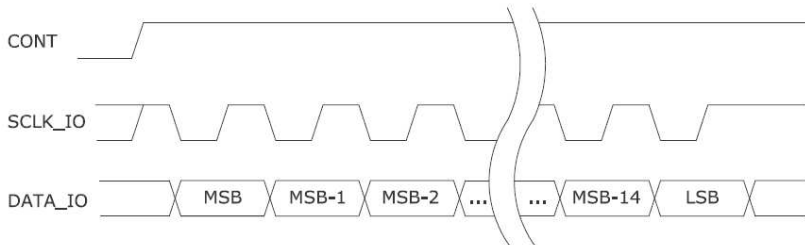
HTPA 32x31:

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

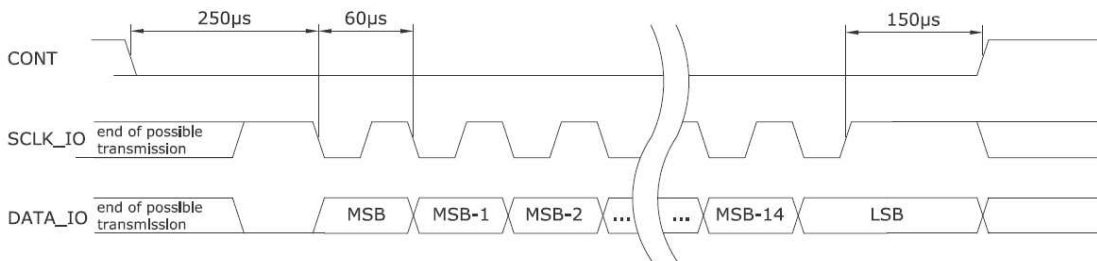
The output drivers for SCLK_IO and DATA_IO are enabled by CONT.

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 μ 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



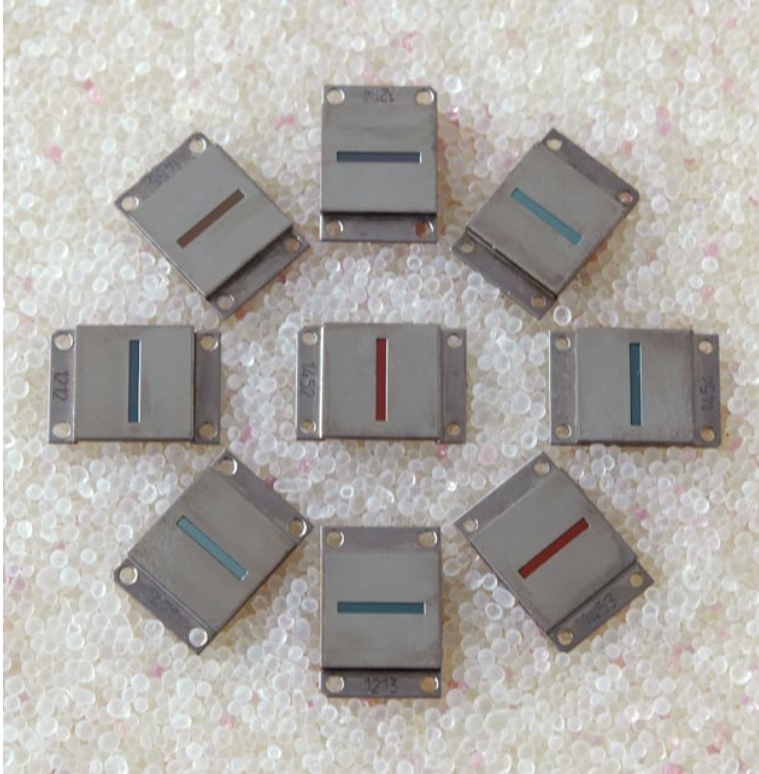
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Pyroelectric Linear Arrays HPL 128/HPL 256

with 128 or 256 elements and integrated CMOS multiplexer



Features

- 128 or 256 elements arranged in one line
- NEP (128 Hz) down to 1.1 nW
- Dynamic range > 75 dB
- Modulation frequency up to 512 Hz
- Integrated CMOS multiplexer
- High long-term stability
- Simple mode of operation
- Operation at ambient temperature
- Small package
- Coated silicon or germanium as infrared window
- Broad band windows (>1.4 μm) or special filters are possible on request
- Customised arrays with up to 256 elements with special sizes
- Modules with linear arrays

Description

The pyroelectric linear arrays HPL 128 and HPL 256 are hybrid detectors with 128 or 256 elements and an integrated CMOS multiplexer.

The pyroelectric chip is made from lithium tantalate (LiTaO_3) with pixel widths of 90 μm (HPL 128) or 42 μm (HPL 256) and lengths of 100 μm , 500 μm or 1000 μm .

The multiplexer includes low-noise preamplifiers for each pixel, analogue switches and an output amplifier. The preamplifiers transform the signal charges of each pixel into a signal voltage, include bandwidth limiting and pass the amplified signal to the sample & hold for the read-out process. The digital inputs are CMOS compatible.

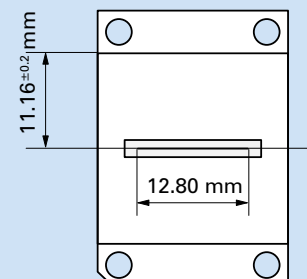
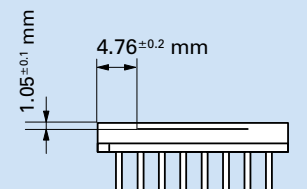
For measurement of the detector temperature a sensor (type AD 590) is integrated into the package. It provides an output current which is proportional to the temperature.

The pyroelectric chip and the read-out circuit are arranged in a metal hermetic package with an infrared window which determines the spectral responsivity.

In common with all pyroelectric detectors, the incoming infrared radiation needs to be pulsed for a measurement to be made.

Typical applications can be found in the fields of temperature measurement and spectrometry.

Position of pixels

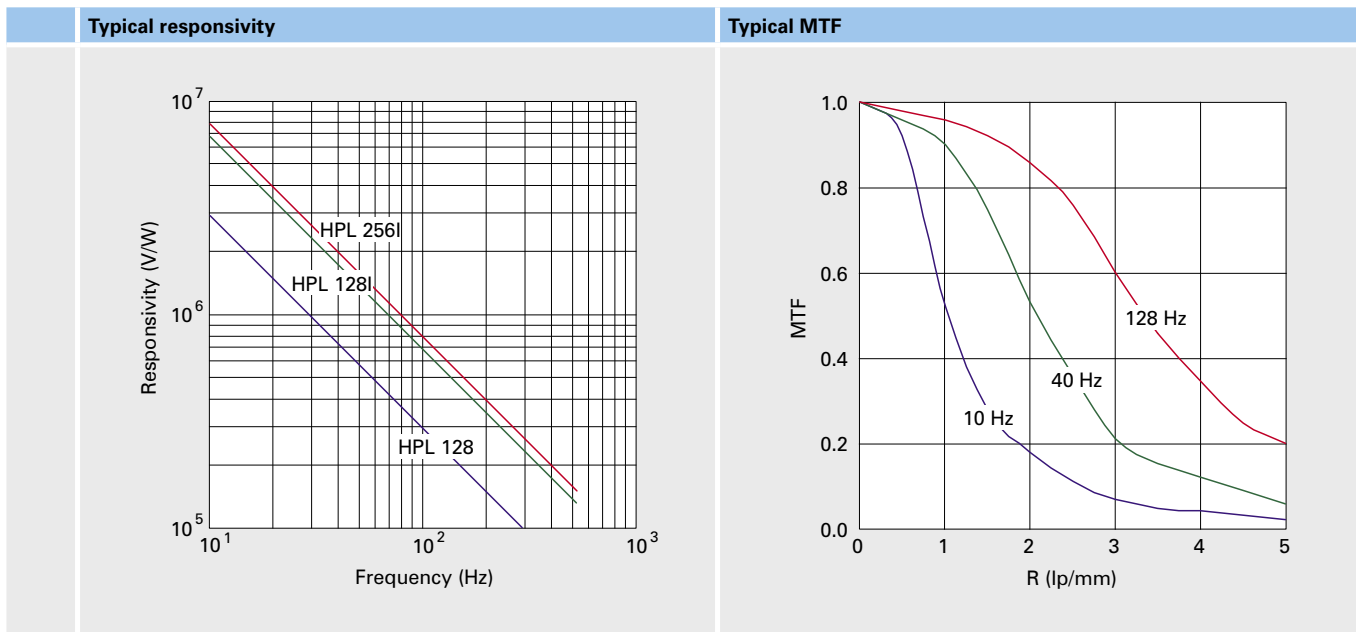


Optical specification										
Type	HPL 128-100	HPL 128I-100	HPL 128-500	HPL 128I-500	HPL 128-1000	HPL 128I-1000	HPL 256I-100	HPL 256I-500	HPL 256I-1000	
Pixel number	128	128	128	128	128	128	256	256	256	
Pixel width in μm	90	90	90	90	90	90	42	42	42	
Pixel length in μm	100	100	500	500	1000	1000	100	500	1000	
Pitch in μm	100	100	100	100	100	100	50	50	50	

Electro-optical specification ¹										
Type	HPL 128-100	HPL 128I-100	HPL 128-500	HPL 128I-500	HPL 128-1000	HPL 128I-1000	HPL 256I-100	HPL 256I-500	HPL 256I-1000	
Responsivity S_V in V/W	230000	540000	230000	540000	230000	540000	620000	620000	620000	
Noise voltage U_N in mV	0.7	0.8	0.9	1.2	1.1	1.9	0.7	0.9	1.1	
NEP in nW	3.0	1.5	3.9	2.2	4.9	3.5	1.1	1.4	1.8	
MTF (R = 3 lp/mm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
Uniformity ² of S_V in %	5	5	5	5	5	5	5	5	5	

¹ Typical values, rectangular chopping with 128 Hz, array temperature 25 °C, black body source temperature 400 °C, filter transmission 100 %.

² No defective elements.

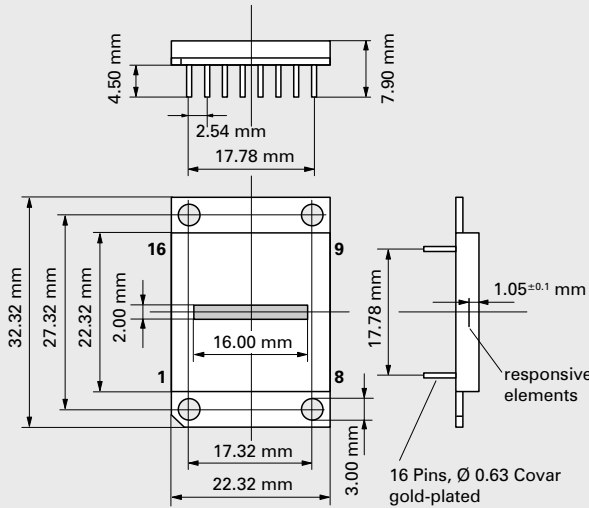


Maximum/minimum conditions ¹			
Parameter	Maximum/minimum value		Unit
VDD, VD2	-0.3 to 7		V
Digital inputs CLK, RES, VVR, VDR, VSH	-0.3 to VDD + 0.3		V
Chopping frequency f_{ch}	10 to 512		Hz
AD590+ to AD590-	-20 to 44		V
Analog output ²	± 5		mA
Maximum irradiance	50		mW/mm ²
Soldering temperature	300		°C
Storage temperature	-20 to 80		°C
Operating temperature	-15 to 70		°C

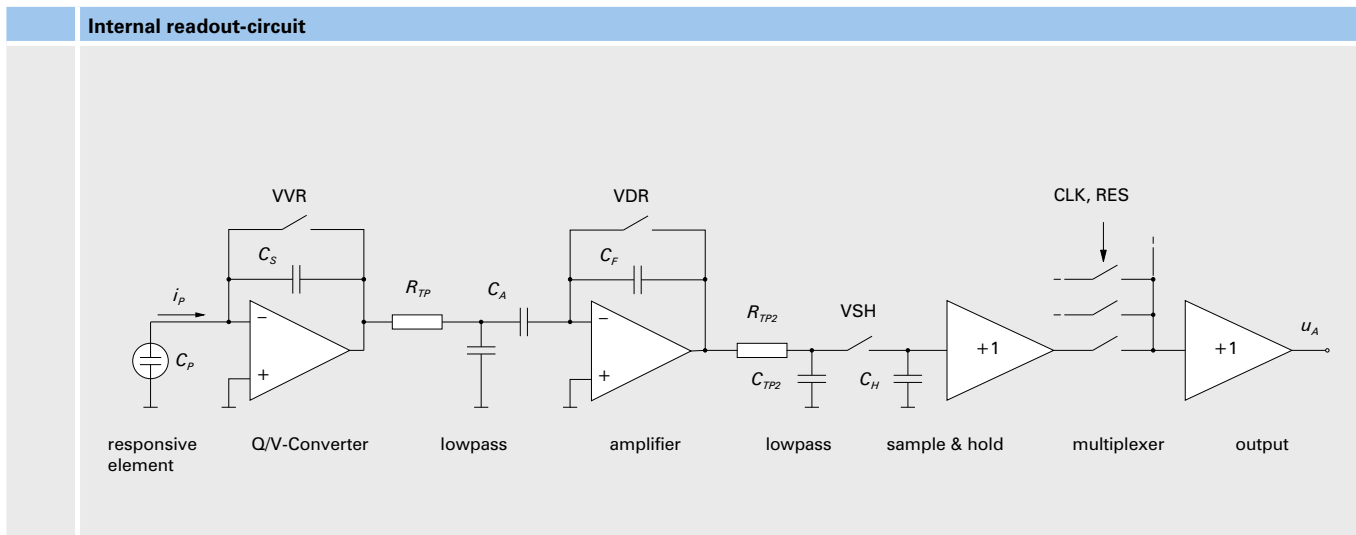
¹ All voltages refer to ground (pin 10, 15). ² Not short resistent.

Electrical parameters ¹				
Parameter	Minimum value	Typical value	Maximum value	Unit
VDD	4.75	5.0	5.25	V
VD2	2.4	2.5	2.6	V
Digital inputs, low voltage	0		0.3 VDD	V
Digital inputs, high voltage	0.7 VDD		VDD	V
Digital inputs, switching treshold		0.5 VDD		V
Digital inputs, leakage current			±1	μA
Current consumption		8		mA
AD590 operating voltage ²			30	V

¹ All Values for VDD = 5 V, VD2 = 2.5V. ² See data sheet of Analog Devices.

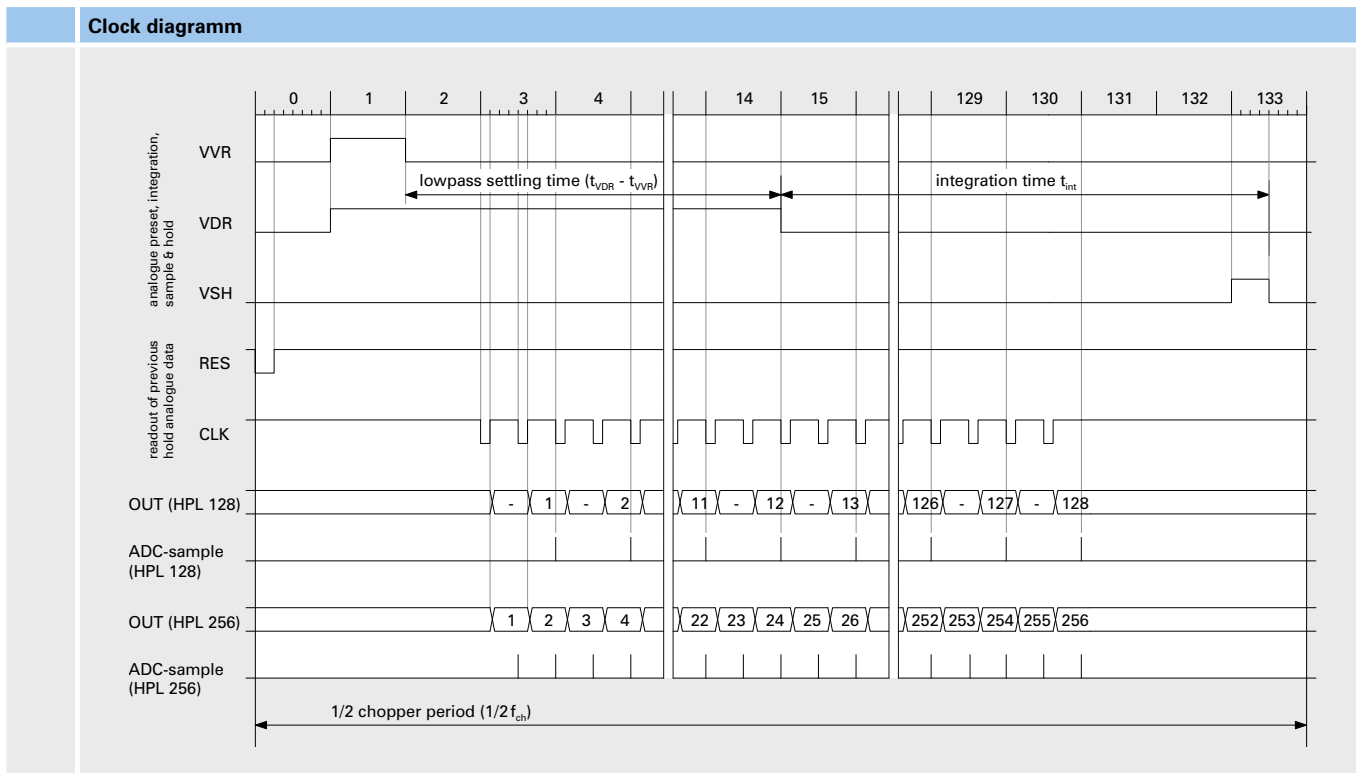
Pins				Package
Number	Name	Remark		
1	CLK	Input clock CLK (trigger on rising edge)		 <p>Dimensions: 4.50 mm, 2.54 mm, 17.78 mm, 7.90 mm, 32.32 mm, 27.32 mm, 22.32 mm, 2.00 mm, 16.00 mm, 17.78 mm, 1.05±0.1 mm, 16 Pins, Ø 0.63 Covar gold-plated, 3.00 mm, 17.32 mm, 22.32 mm.</p>
2	RES	Input clock RES (active low)		
3	VVR	Input clock VVR (active high)		
4	VDR	Input clock VDR (active high)		
5	VSH	Input clock VSH (active high)		
6	VD2	Operating voltage (+2.5 V)		
7	VDD	Operating voltage (+5 V)		
8	VD2	Operating voltage (+2.5 V)		
9	OUT	Analog signal output		
10	GND	Ground		
11	n.c.	not connected		
12	AD590+	Temperature sensor		
13	AD590-	Temperature sensor		
14	case	Case		
15	GND	Ground		
16	VDD	Operating voltage (+5 V)		

Connect pin 6 to pin 8 (VD2), pin 7 to pin 16 (VDD), pin 10 to pin 15 (GND).

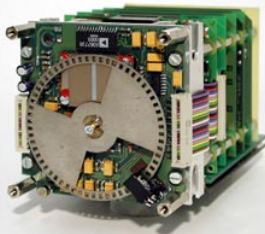


Clock parameters ¹					
Parameter	Relative value	Minimum value	Typical value	Maximum value	Unit
Chopping frequency ² f_{Ch}		10	128	512	Hz
Readout clock CLK $f_{CLK} = 2 \cdot f_{Ch} \cdot 268$	$1/t_{CLK}$	0	69	300	kHz
Reset clock low-impulse duration t_{RES}	$1/2 t_{CLK}$	1.8	7.5		μs
Clock VVR high-impulse duration t_{VVR}	$2 t_{CLK}$	7.5	30		μs
Clock VDR high-impulse duration ³ t_{VDR}	$28 t_{CLK}$	200	400		μs
Clock VSH high-impulse duration t_{VSH}	$1 t_{CLK}$	3.5	15		μs
Setting time at the output t_{out}				1	μs

¹ All values for VDD = 5 V, VD2 = 2.5V. ² $t_{Ch\ low} = t_{Ch\ high}$. ³ For $f_{Ch} = 512$ Hz t_{VDR} should be $56 \cdot t_{CLK} = 200 \mu s$.



Module MES-M3 with linear array

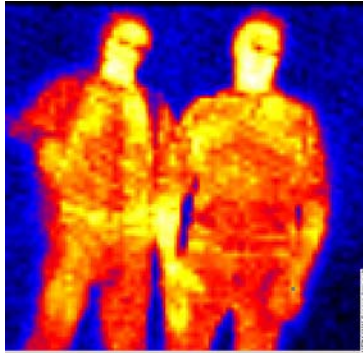


Features

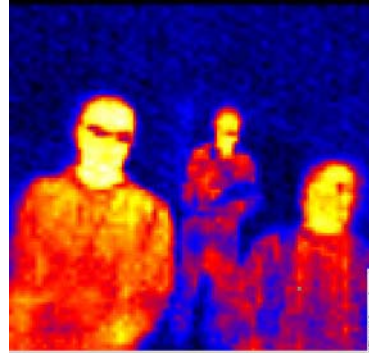
- 128 or 256 elements
- 256 Hz chopper frequency
- Power supply and clock generator
- 16 bit analogue to digital converter
- Digital signal processor
- Serial interface RS232/RS422 or Fast Ethernet
- Windows® software

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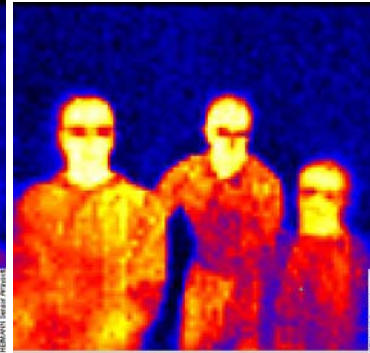
THERMAL IMAGING WITH THERMOPILE ARRAYS



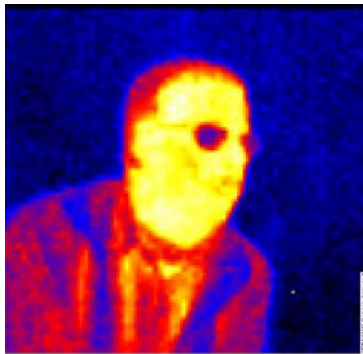
1
Group Pictures



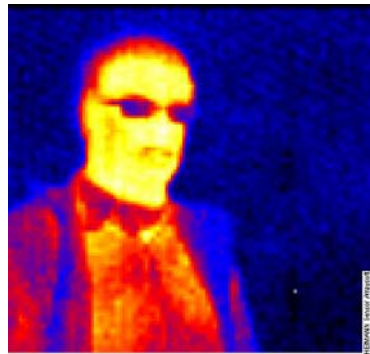
2



3



4
Single portraits



5

Taken by Heimann arrays 64x62