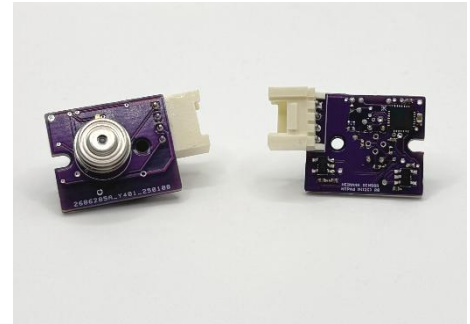


HTPAd HiM I²C

The HTPAd HiM I²C module is a device designed for easy access remote temperature measurements. Consisting of a Heimann Sensor HTPAd thermopile sensor and the required readout electronics, the module facilitates development as well as handling.

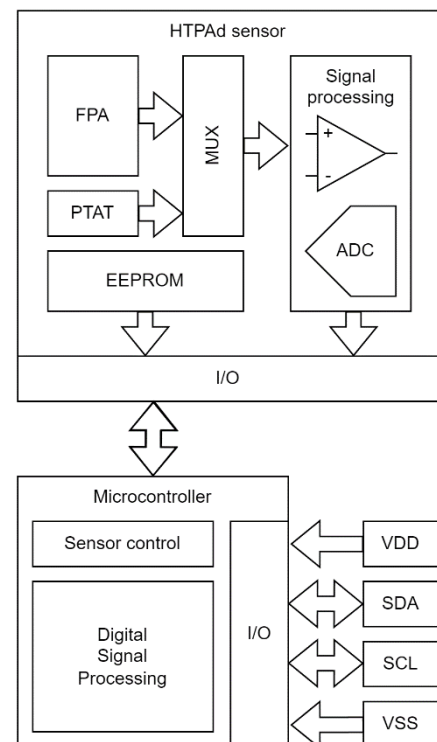
Due to smallest size, integration into limited space is feasible and provides maximum areas of application. Typical areas of application for the module are imager applications for human or fire/overheat detection or temperature measurements for process surveillance.

The module is configurable for different HTPAd sensors, matching different applications and Field of View.

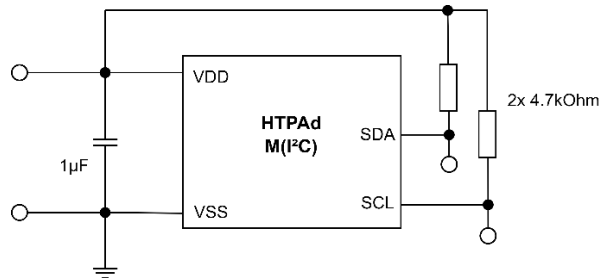


The core features of the module are:

- Low power consumption of 80 mW operating
- Digital input voltage selectable between 3.3 V and 5 V
- High framerates of typical 5.8 Hz (depending on HTPAd sensor speed and calibration)
- Small size of 20 mm x 17 mm (excl. plug)
- Single connection plug for supply voltage and I²C interface
- different HTPAd sensors available (8x8 pixels, 16x16 or 32x32 pixels)
 - for different spatial resolutions (Field of View from 19° up to 120°)
- high temperature measurement accuracy
- Software-controlled pixel selection to achieve higher frame rates
- existing ESP32 demo code for easy access and development start



Typical Application Circuit



Order-Code

HTPA32x32d	R2	L5.0/0.85	F7.7	e	Hi	M	(I²C)
HTPA32x32d	R2	L5.0/0.85	F7.7		Hi	M	(I²C)
HTPA32x32d	R2	L2.1/0.8	F5.0		Hi	M	(I²C)
HTPA32x32d	R2	L1.9/0.8			Hi	M	(I²C)
HTPA32x32d	R2	L1.8/0.8			Hi	M	(I²C)
HTPA32x32d	R2	L1.7/0.8			Hi	M	(I²C)

	Group	Description
1	Sensor Type	TP Array with 32x32 pixels For all available HTPA and module combinations contact our support
2	Revision	Silicon revision 2
3	Optics	Focal length/F-Number Focal length: L5.0 = 5.0 mm F-Number: 0.85
4	Filter	F: Filter characteristics
5	External Aperture	Not declared: without external aperture e: with external aperture
6	Sensitivity	Hi default sensitivity
7	Version	M: Modul: HTPA sensor soldered to PCB, calibrated stream
8	Interface	i ² C: 4 Pin Connector

Electric Specifications

Table 1: Absolute Maximum Ratings

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{DD}		-0.3		5.8	V
Voltage at all inputs and outputs	V _{IO}				V _{DD} +0.3	V
Storage Temperature	T _{STG}		-40		85	Deg. C

Table 2: Operating Conditions

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{DD}		3.5	5.0	5.5	V
Supply Current (module running)	I _{DD}			16		mA
Standby Current (module in sleep state)	I _{SBY}			2.9		mA
Sleep Current (module in deep sleep state)	I _{SBY}			80		µA
Operation Temperature	T _A		-20		85	Deg. C
ESD-Protection		Human body model	2000			kV
		100pF + 1k50hm				
Internal I ² C Pull up	RPU			-		kOhm
Frame rate (Full Array)	FR1		3 @100kHz I ² C	4.7 @400kHz I ² C	6 @>600kHz I ² C	Hz

I²C Timings

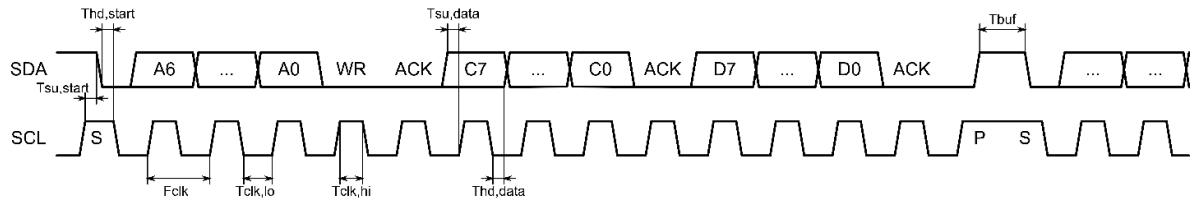
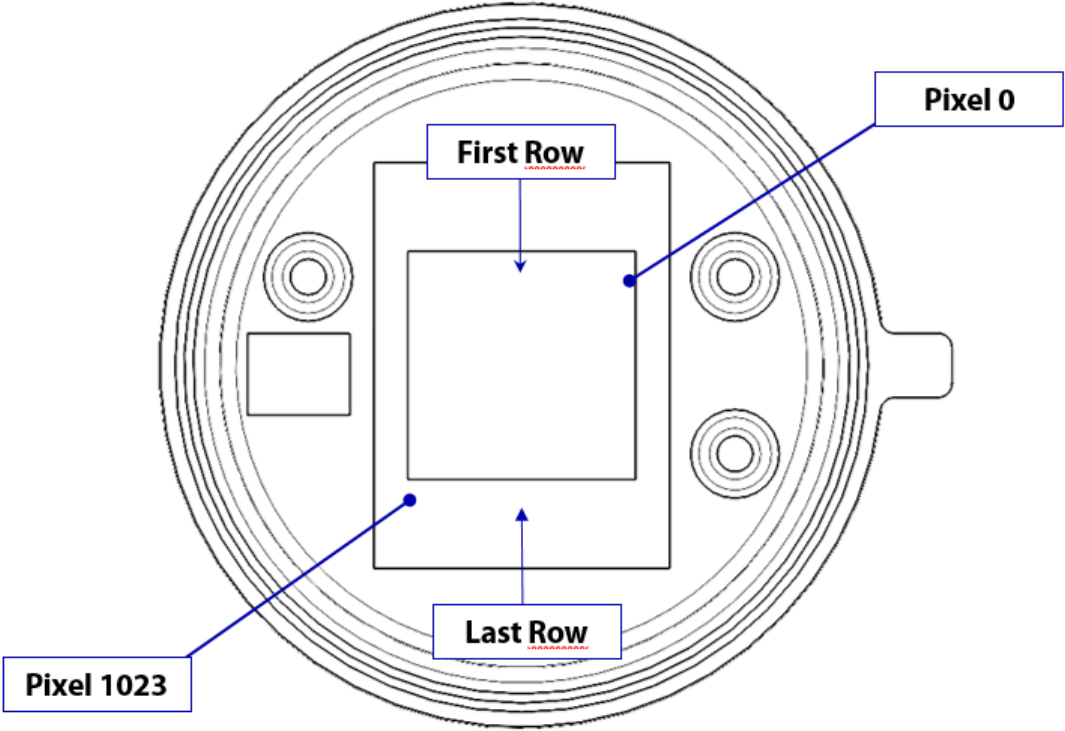


Table 3: I²C Timings

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
I ² C clock frequency	F _{CLK}			400	700	kHz
low pulse duration	T _{CLK,lo}	F _{CLK} = 400kHz	1.3			µs
high pulse duration	T _{CLK,hi}	F _{CLK} = 400kHz	0.6			µs
data set up time	T _{SU,data}	F _{CLK} = 400kHz	0.1			µs
data hold time	T _{hd,data}	F _{CLK} = 400kHz			0.9	µs
start setup time	T _{SU,start}	F _{CLK} = 400kHz	0.6			µs
start hold time	T _{hd,start}	F _{CLK} = 400kHz	0.6			µs
stop setup time	T _{SU,stop}	F _{CLK} = 400kHz	0.6			µs
stop hold time	T _{hd,stop}	F _{CLK} = 400kHz	0.6			µs
time between STOP / START	T _{buf}	F _{CLK} = 400kHz	1.3			µs
Time startup (after Power on Reset)	T _{startup}			350		ms
Time wakeup (after sending WAKEUP)	T _{wakeup}			1		ms

Optical Orientation of Pixels



Characteristics

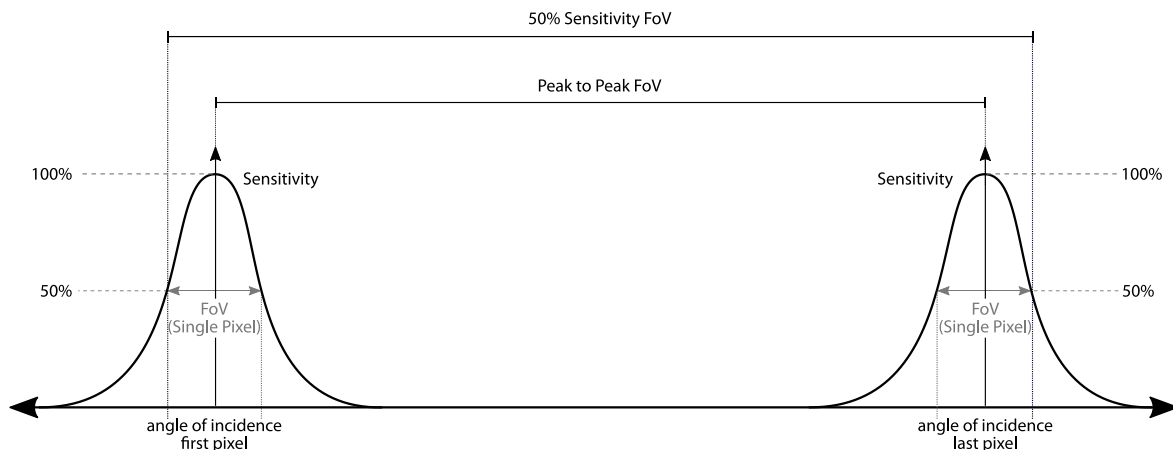
Common Specification

Technology	n-poly/p-poly Si
Element Resistance	approx. 300 kOhms
Thermal pixel time constant	<6 ms
Digital Interface	I ² C
Pitch	90 µm
Absorber size	44 µm
1024 sensitive elements	

Optical Characteristics

	L1.7	L1.9	L2.1	L5.0
Focal length:	1.7 mm	1.9 mm	2.1 mm	5.0 mm
F-Number:	0.8	0.8	0.8	0.85
Field of view*:	120 x 120°	100 x 100°	94 x 94°	34 x 34°
Coating	ARC	ARC	LWP 5.0	LWP 7.7

*Field of view is specified as 50 % sensitivity (see diagram below).



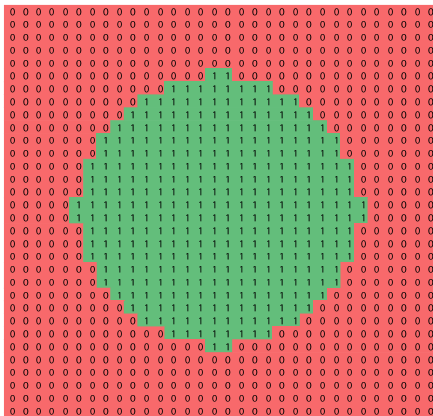
Accuracy:

±3 % or ±3 K (whatever is larger) in the working ambient temperature range of 5 °C to 50 °C and object temperatures ≤300 °C.

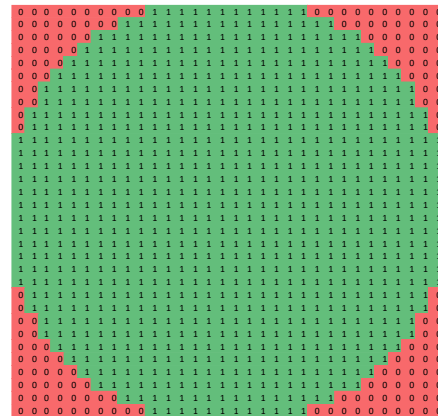
Radiometric Radius

The radiometric radius is specified for pixels listed below with a "1". All pixels outside this area can have a higher tolerance and less accuracy.

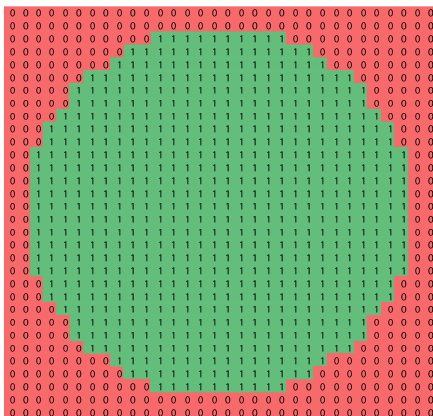
L1.7



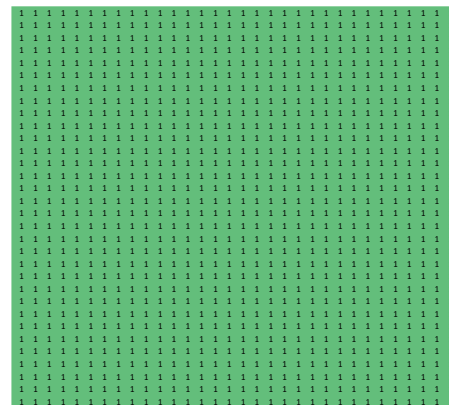
L1.9



L2.1

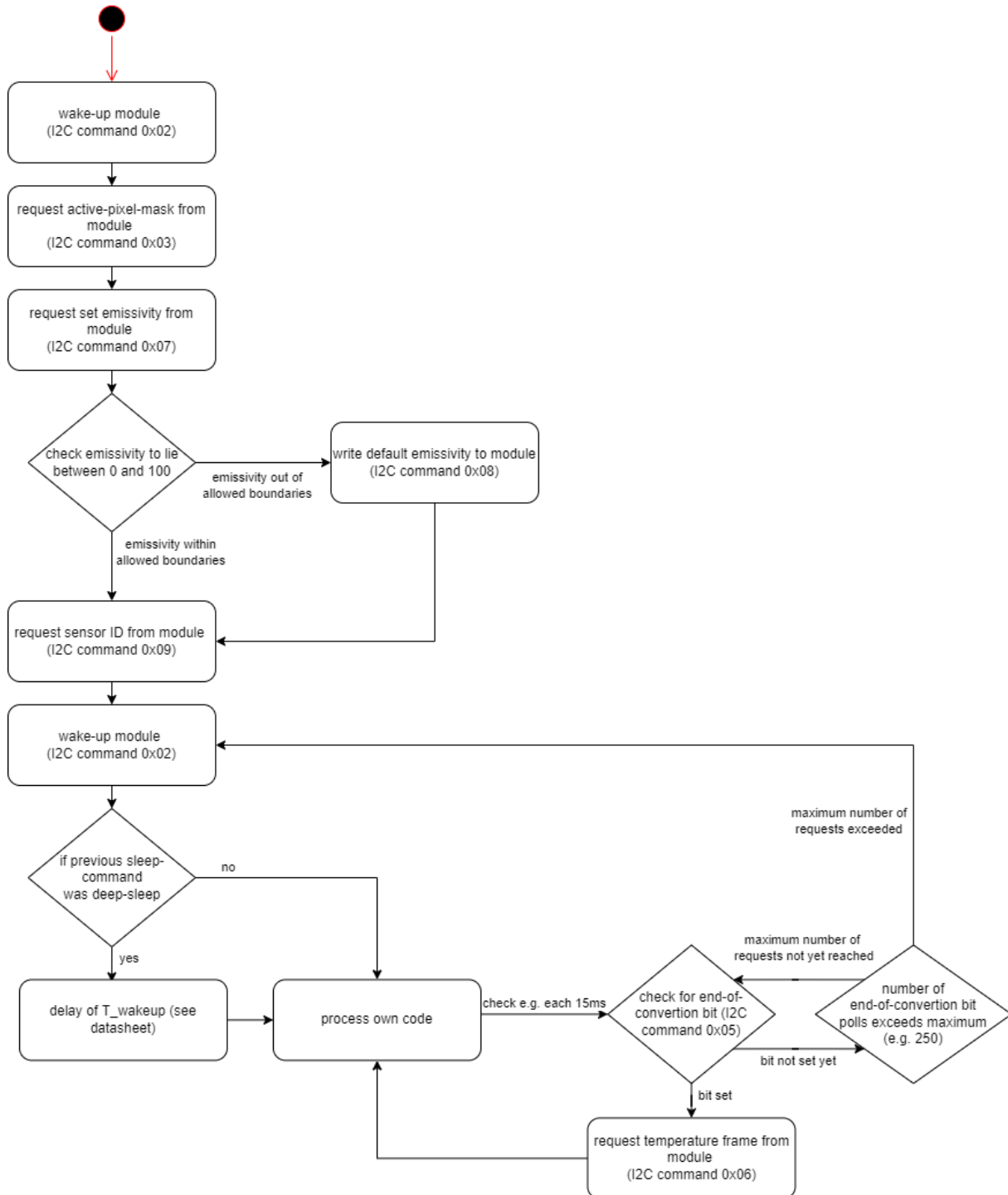


L5.0



Communication and Timings

Proposed flow chart of communication.



Serial order of data in stream

HTPA32x32d Temperature Mode	
Dataset	Value
0	Temperature of Pixel(0) in K*10
1	Temperature of Pixel(1) in K*10
2	Temperature of Pixel2 in K*10
3	Temperature of Pixel3 in K*10
...	...
n*	Temperature of Pixel3 in K*10
n+1	TAmb in K*10

Each dataset consists of a 16-bit value, first the Low-Byte is send, then the High-Byte.

*n=1023

Control Messages

The module is accessed via the I²C protocol. Therefore, the device address is set as 0x1C.
The following I²C commands are available.

Command		Remarks
Sleep	0x01	Device is in sleep after power on reset
WakeUp	0x02	Also starts data conversion stream of sensor
ReadMask	0x03	Device goes into sleep after transmission of mask
WriteMask	0x04	Device goes into sleep after receiving and writing mask. Delay of 120 ms required after sent of mask. TAKE CARE: This stores the mask to the FLASH of the controller. FLASH endurance is about 10,000 write cycles. Therefore, don't do that on every power up, only if necessary.
ReadEoC	0x05	Slave transmits End of Conversion bit.
ReadData	0x06	
ReadEmissivity	0x07	Device goes into sleep after tranmission of emissivity
WriteEmissivity	0x08	Device goes into sleep after write of emissivity. Delay of 250ms required after new emissivity sent.
ReadSensorID	0x09	Device goes into sleep after tranmission of SensorID
DeepSleep	0x0A	Power supply of sensor will be disabled. Requires delay (Time wakeup) after WakeUp for voltage stabilization of the sensor VDD.

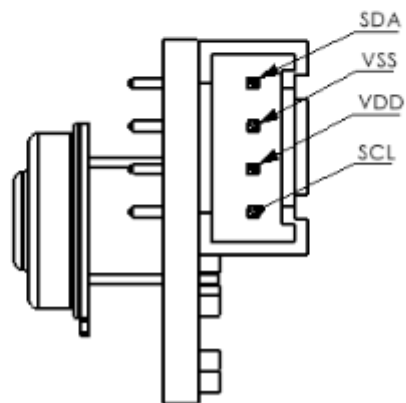
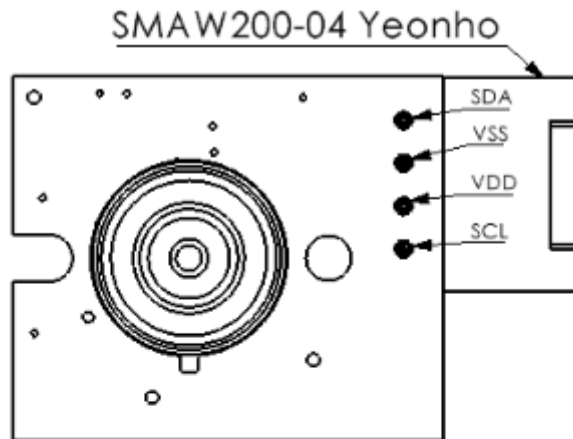
MODULE SPECIFICATIONS AND TRANSFER PROTOCOL

HTPA32x32d_HiM_I²C

Rev.0: 2025-04-04 Forg/Nägler
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Pinout

For powering the module V_{DD} is +5 V (see drawings below).



There are no pull-ups in the I2C lines realized.

Module Dimensions

