

# HTPA80x64dR2BeamProfiler

Datasheet for Thermopile Array Sensor

## Content

1	Cleaning and Handling of Sensors with Optical Elements .....	4
2	Optical Orientation .....	6
3	Characteristics .....	7
3.1	Common Specifications .....	7
3.2	Filter Characteristics .....	7
4	Communication and Timings .....	8
5	Communication .....	9
6	Electric Specifications .....	10
7	Serial Order of Data in Stream .....	10
8	Packets (UDP, only Ethernet device) .....	11
9	Control Messages .....	11
10	Order Code Chart .....	13
11	Outer Dimension .....	14

## Changelog

2024-03-12	Initial Release
------------	-----------------

# 1 Cleaning and Handling of Sensors with Optical Elements

## Cleaning of Filter with Isopropyl Alcohol or Acetone

This is the method most universally used for cleaning optical elements with or without coatings. Filters or lenses mounted in our sensors may be cleaned rubbing the surfaces lightly with a clean, soft, all-cotton cloth or cotton swab during immersion in solvent or simply moistened with the solvent. The parts are then immediately wiped dry with another clean, soft, all-cotton cloth or cotton swab.

## Cleaning with Detergent and Water

A very mild, non-abrasive detergent (one which does not contain additives) and water may also be used for cleaning optical elements. In general, a detergent and water mixture is an excellent method for removing fingerprints and other smudges. The liquid detergent is first mixed with deionized water (proportions recommended by the manufacturer should be followed). The element is then washed, rinsed, and immediately wiped dry. Use a clean, soft cloth when cleaning and drying. If the part is allowed to dry in air, a permanent stain may result.

Please note:

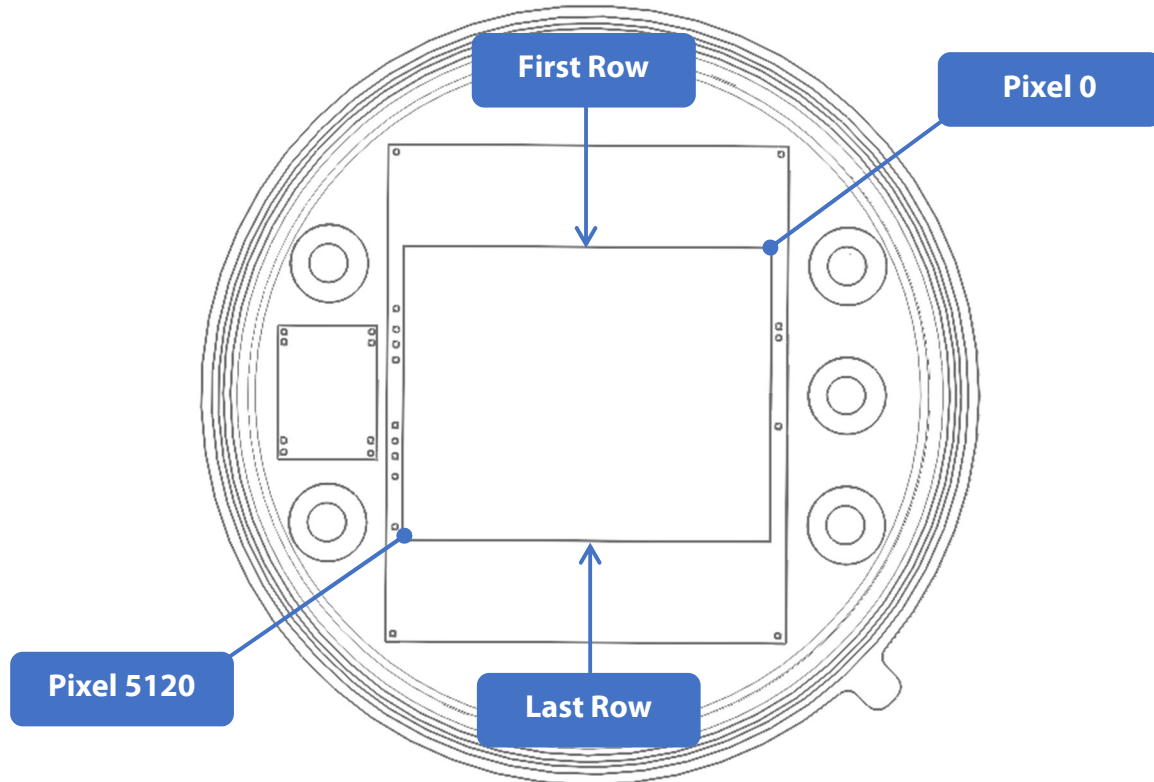
- Do not use isopropyl alcohol or acetone or detergent if the elements will be mounted in an assembly with a finish which may be soluble by these solvents.
- Please avoid glass isolation being moistened by solvent.
- If the part is allowed to dry in air, a permanent stain may result.

## Handling Advice

Sensors with optical elements deserve special consideration in their handling and care. Ordinarily, filters or lenses are cleaned and inspected prior to shipment. If proper care is exercised during handling cleaning should not be necessary prior to use.

- Wear gloves when handling a sensor or optical element. Lightweight nylon or cotton gloves which are relatively lint-free are recommended.
- Avoid touching the surface of filters and lenses.
- Protect devices from static discharge and static fields.
- Thermopile sensors are electrostatic sensitive devices. Sensors should be handled over an electrostatic protected work area.
- Precautions should be taken to avoid reverse polarity of power supply for sensors with integrated signal processing. Reversed polarity of power supply results in a destroyed unit.
- Sensors should rest preferably in a partitioned container where the mounted filters or lenses will be not coming into contact with other material.
- During storage optical surfaces should be covered to avoid contamination from the surrounding environment.
- A covered container can eliminate damage during transportation and storage.
- Sensors or optical elements should be stored in a restricted access area to eliminate handling.
- Do not expose the sensors to aggressive detergents such as freon, trichlorethylen, etc.
- Avoid rotating the sensors when they are soldered into a PCB or something similar.
- Shortening of the pins is not suggested. This may cause cracks in the glass of the pins and result in a leakage.
- If this is necessary, a tool for this is recommended. Please contact Heimann Sensor for further information.

## 2 Optical Orientation



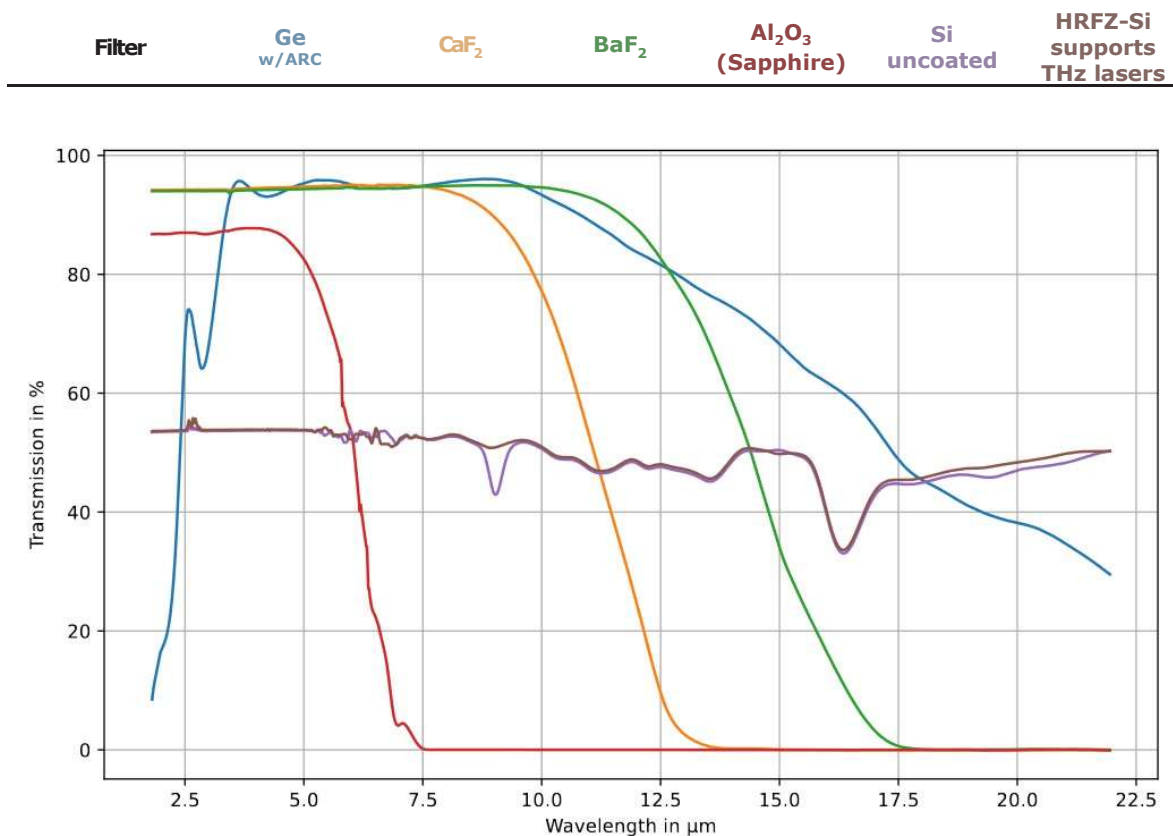
## 3 Characteristics

### 3.1 Common Specifications

Technology:	n-poly/p-poly Si
Thermal pixel time constant:	TBD
Digital Interface:	SPI
NVM size:	256 kBit
Pitch:	90 $\mu\text{m}$
Absorber size:	44 $\mu\text{m}$
Max. Framerate:	45 Hz
(complete frame with maximum SPI, sensor clock speed and reduced ADC resolution)	
5120 Pixels	

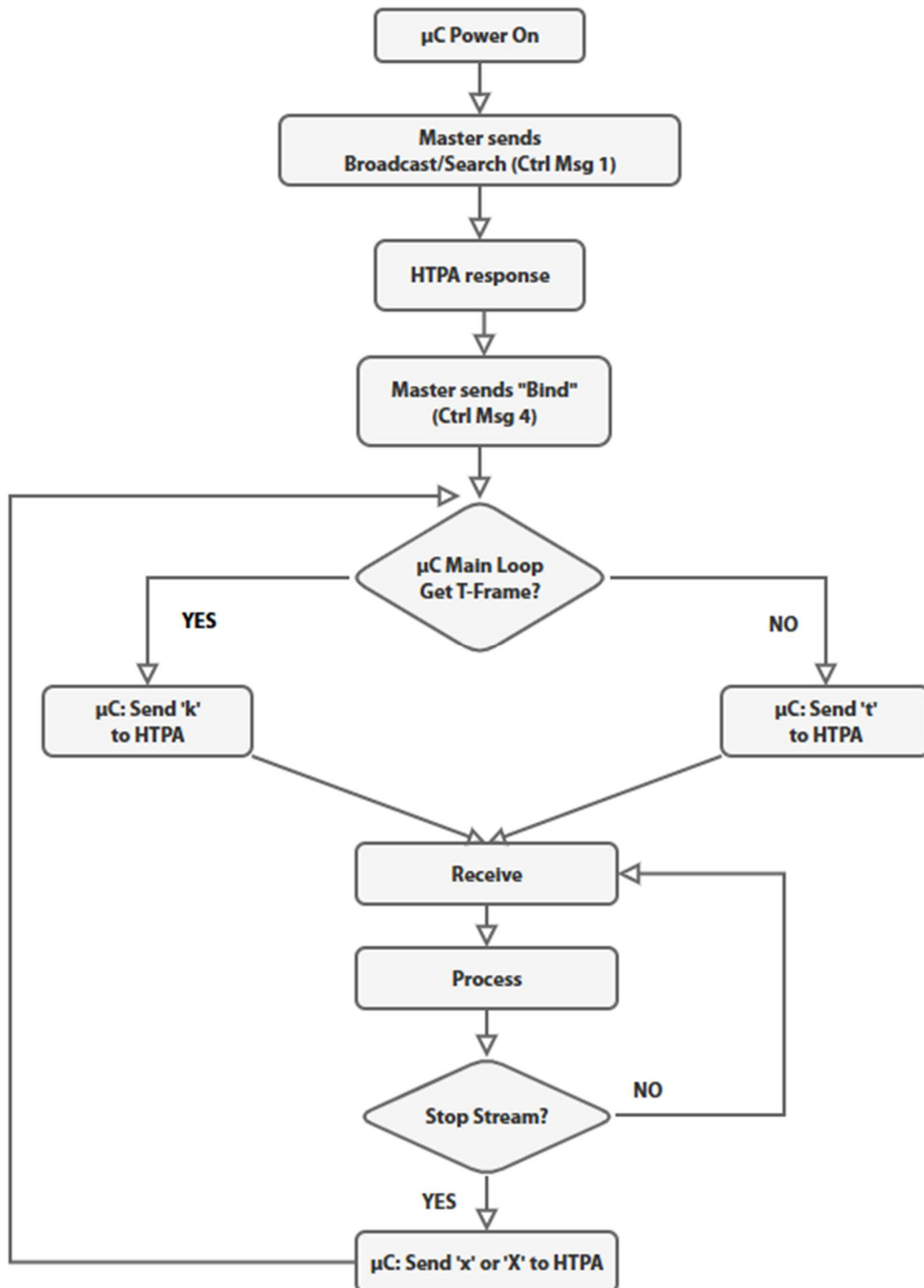
### 3.2 Filter Characteristics

Typical filter transmissions by 1 mm thickness:



## 4 Communication and Timings

Proposed flow chart of communication. (Master is referred as  $\mu\text{C}$ , Slave as HTPA module).



## 5 Communication

COMMUNICATION VIA UDP	
Sent Chart	Result / Received message
'a'/'A'	decreases / increases CLK setting
'b'	measures VDD (referenced to VREF1225)
'c'	captures single voltage frame (use ADC of $\mu\text{C}$ )
'f'	toggles between sending raw and compensated voltages, when sending 't'
'h'	pushes binary EEDATA out
'i'/'I'	decreases / increases BIAS setting
'j'/'J'	decreases / increases BPA setting
'G'	shows current configuration settings (CLK, BIAS, BPA,...)
'k'	reads single temperature frame; output in binary format
'K'	sends continuous binary temperature data stream ( $\mu\text{C}$ -ADC)[K*10] output of a complete cycle  <b>For a detailed description of the serial order see next page.</b>
'M'	shows current and calibration settings; device prints the following stream: <b>"HTPA series responded! I am Arraytype 11 MODTYPE 5"</b> <b>"HTPA80x64d v.X.XX Heimann Sensor GmbH; written by M. Schnorr YYYY-MM-DD"</b> Version information <b>"I am running on XXXX.X kHz"</b> actual MCLK-setting in kHz <b>"MAC-ID: X IP: Y DevID: Z\r\n"</b> X=MAC-ID of the device, i.e. "00.97.FF.00.10.08"; Y=current IP of the device, Z=DeviceID, range 0000000000...4294967295
'p'	toggles PU (pull-up) setting
'q'/'Q'	allows changes (required for calibration)
'r'/'R'	decreases / increases resolution
't'	continuous binary voltage data of the sensor is transmitted output of a complete cycle  <b>For a detailed description of the serial order see next page.</b>
'v'	announces IP (only Ethernet devices)
'W'	calibration (ATTENTION! Old Dataset cannot be restored!)
'x'	stops stream without prompt
'X'	stops stream by sending "STOP!\r\n"

---

**Please be aware, that the source and destination port has to be 30444.**

---

## 6 Electric Specifications

Table 1: Operating Conditions

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	$V_{DD}$		4.5	5.0	5.5	V
Operation Temperature	$T_A$		0		85	Deg. C

## 7 Serial Order of Data in Stream

HTPA80x64d Temperature Mode	
Dataset	Value
0	Temperature of Pixel0 in K*10
1	Temperature of Pixel1 in K*10
2	Temperature of Pixel2 in K*10
3	Temperature of Pixel3 in K*10
...	...
5119	Temperature of Pixel5119 in K*10
5120	el. Offset 0
5121	el. Offset 1
...	...
6399	el. Offset 1279
6400	VDD
6401	TAmb
6402	PTAT0
6403	PTAT1
6404	PTAT2
6405	PTAT3
6406	PTAT4
6407	PTAT5
6408	PTAT6
6409	PTAT7

HTPA80x64d Voltage Mode	
Dataset	Value
0	absolute Voltage of Pixel0 in digits
1	absolute Voltage of Pixel1 in digits
2	absolute Voltage of Pixel2 in digits
3	absolute Voltage of Pixel3 in digits
...	...
5119	absolute Voltage of Pixel5119 in digits
5120	el. Offset 0
5121	el. Offset 1
...	...
6399	el. Offset 1279
6400	VDD
6401	TAmb
6402	PTAT0
6403	PTAT1
6404	PTAT2
6405	PTAT3
6406	PTAT4
6407	PTAT5
6408	PTAT6
6409	PTAT7

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

## 8 Packets (UDP, only Ethernet device)

Packet details for HTPA80x64d

Packet No.	Packet size	Packet contains
1	1283	Packet index 1 (8bit), data of Pixel0-Pixel640
2	1283	Packet index 2 (8bit), data of Pixel641-Pixel1281
3	1283	Packet index 3 (8bit), data of Pixel1282-Pixel1922
4	1283	Packet index 4 (8bit), data of Pixel1923-Pixel2563
5	1283	Packet index 5 (8bit), data of Pixel2564-Pixel3204
6	1283	Packet index 6 (8bit), data of Pixel3205-Pixel3845
7	1283	Packet index 7 (8bit), data of Pixel3846-Pixel4486
8	1283	Packet index 8 (8bit), data of Pixel4487-el.Offset7
9	1283	Packet index 9 (8bit), data of el.Offset8-el.Offset648
10	1283	Packet index 10 (8bit), data of el.Offset649 to end of frame

## 9 Control Messages

In the set of control messages, expressions in angled braces have to be substituted by following strings:

<b>[IP]</b>	inserts IP in ASCII format, i.e.: "192.168.240.122"
<b>[MACID]</b>	inserts MAC ID in ASCII format and hexadecimal, i.e.: "00.1A.22.33.44.55"
<b>[AT]</b>	inserts index of array type in ASCII format (for HTPA80x64d – "11")
<b>[MCLK]</b>	inserts Frequency of MCLK in ASCII format and kHz, i.e.: "1050.1"
<b>[MSK]</b>	inserts subnet mask in ASCII format, i.e.: "255.255.255.000"
<b>[DEVID]</b>	inserts 10 digit device ID in ASCII format, i.e. "0123456789" Range: 0000000000... 4294967295
<b>[MODT]</b>	inserts index of module type in ASCII format, i.e.: 005
<b>[ADCRES]</b>	inserts ADC resolution in ASCII format, i.e.: "16" Range: 08...16

### Set of Control Messages

Message1:	"Calling HTPA series devices" (only Ethernet device)
Conditions:	can be sent as Broadcast or if device already known as normal packet
Answer:	"HTPA series responded! I am Arraytype <b>[AT]</b> MODTYPE <b>[MODT]</b> \r\n ADC: <b>[ADCRES]</b> \r\n" Firmware version, date and author information "I am running on <b>[MCLK]</b> kHz\r\n"

"MAC-ID: [MACID] IP: [IP] DevID: [DEVID]\r\n"

A second packet with calibration depending information is send.

---

Message2: "x Release HTPA series device" (only Ethernet device)

Result: Device disables hardware IP filter. All packets except ARP's, DHCP requests, Broadcasts, Message1, Message3 and Message4 are discarded.

Answer: "HW-Filter released\r\n"

---

Message3: "HTPA device IP change request to [IP].[MSK]." (only Ethernet device)

Result: The device changes the IP and the subnet mask to the given value and writes it to EEPROM. The IP becomes the default IP, therefore the device will use it at the next reset, if no DHCP is found.

Answer: "Device changed IP to [IP]. and Subnet to [MSK].\r\n"

---

## Control Messages (continued)

---

Message4: "Bind HTPA series device" (only Ethernet device)

Result: Device enables hardware IP filter. Only packets from sender IP, ARP's, DHCP requests and Broadcasts are accepted. Device accepts now the control characters listed in **Communication**.

Answer: "HW Filter is [IP] MAC [MACID]\n\r"

Insert in the above string the IP and MAC-ID of the Sender from Message4.

---

Message5: "Set EEPROM data"

Conditions: Only possible if Message 4 already successful sent.

**ATTENTION!** Calibration data is overwritten!!!

Result: Writes the next received packets into EEPROM, if packet size is equal to 1024 bytes. Device writes to EEPROM, until EEPROM is completely filled. EEPROM size depends on device type: HTPA80x64: 32768 bytes.

Answer: "Write was successful.\n\r"

---

Message6: "Set Emission to [EPSILON]"

Result: The given emissivity [EPSILON] is written to the EEPROM. The emissivity can be used for customer specific purposes to compensate the radiation factor of different materials.

Answer: "Emission changed to [EPSILON]%\n\r"

---

## 10 Order Code Chart

HTPA80x64d	R2	Beam Profiler	(UDP)	<b>[Ge]</b>
HTPA80x64d	R2	Beam Profiler	(UDP)	<b>[CaF<sub>2</sub>]</b>
HTPA80x64d	R2	Beam Profiler	(UDP)	<b>[BaF<sub>2</sub>]</b>
HTPA80x64d	R2	Beam Profiler	(UDP)	<b>[FZSi]</b>
HTPA80x64d	R2	Beam Profiler	(UDP)	<b>[Si]</b>
HTPA80x64d	R2	Beam Profiler	(UDP)	<b>[Al<sub>2</sub>O<sub>3</sub>]</b>

**Bold: Selectable options**

Regular: Fixed/Not selectable

