HTPA 16x4 Module Specifications and Transferprotocol

Rev.0.02: 2012.04.10 Schnorr

Electrical Specifications:

VDD:	Supply (+3.3V DC)
VSS	GND
Power Supply:	**3.3** VDC +/- 5%, 300mA
IDD (Operating mode)	220 mA

Pinout:

No.	Function	Type
1	SCL	Input
2	SDA	Input/Output
3	VDD	Power
4	VSS	Power

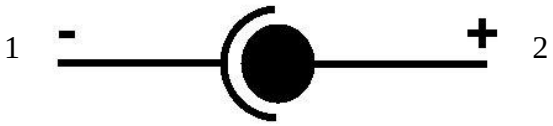
Connector layout: see drawings.

Ethernet-Interface:

Protocol Specifications:

Protocol type:	UDP
All communication on Port:	30444

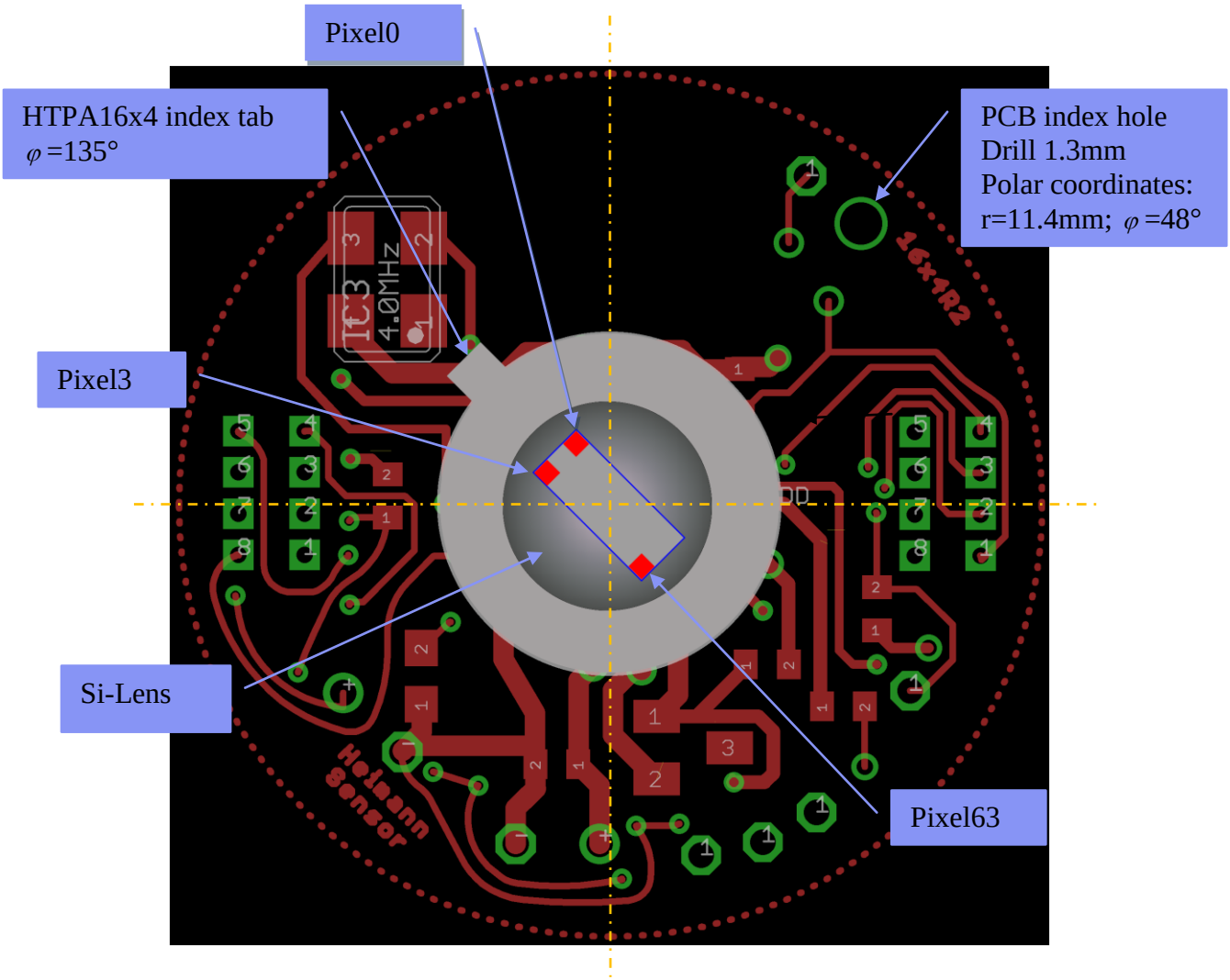
Power connection at Ethernet device:



1	VSS	(-)	GND
2	VDD	(+)	Supply (+3.3V DC)

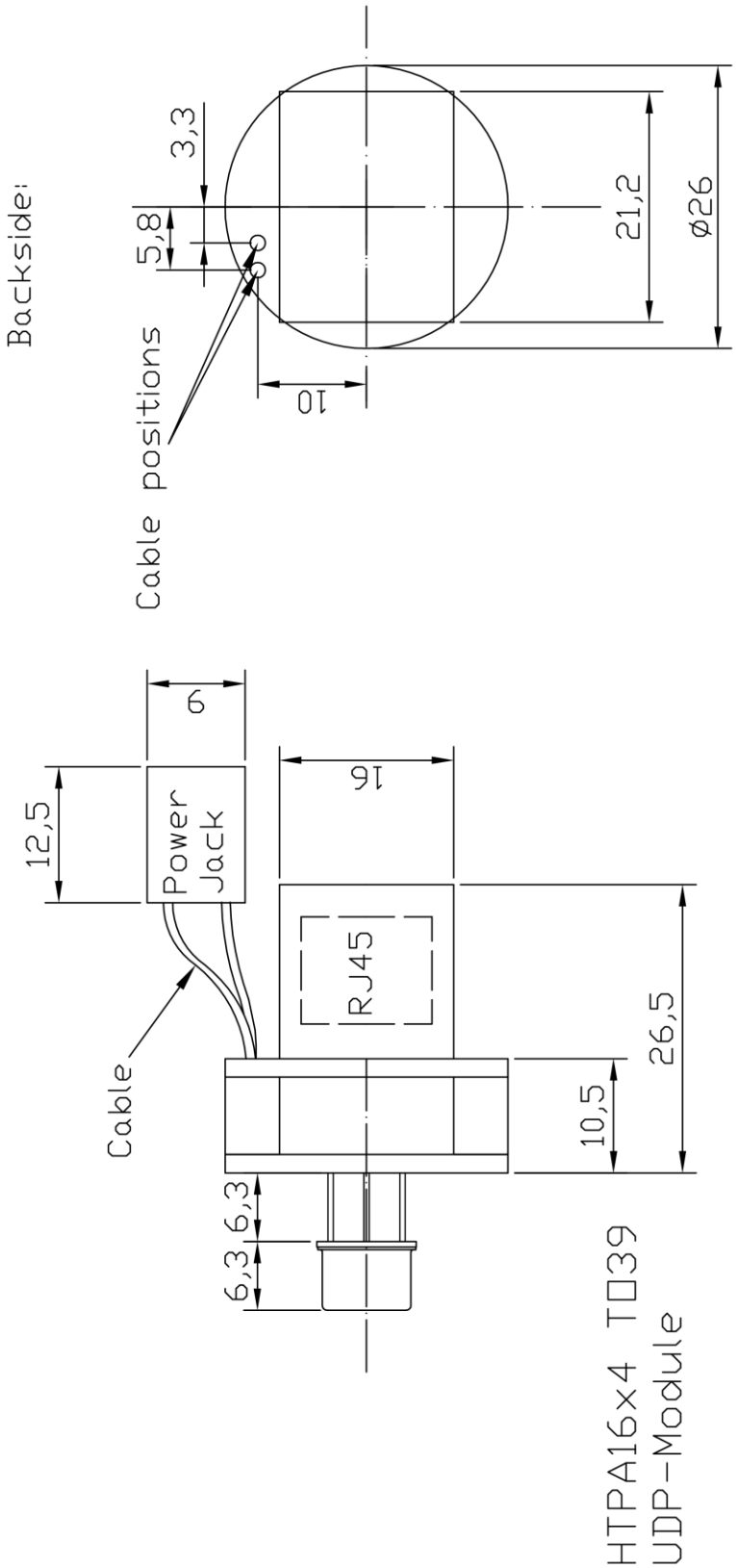
Power Supply: **3.3** VDC +/- 5%, 300mA

Optical Orientation of Pixels:



Top View

Module dimensions:



Communication:

Communication via Terminal	
Sent Char	**Result/Received message**
'a'	Decreases the operating frequency (refresh rate) of the array
'A'	Increases the operating frequency (refresh rate) of the array
'b'	Measure VDD (referenced to VREF1225)
'B'	Dump whole EEPROM (Module)
'c'	Capture single voltage frame. Output binary via UDP.
'd'	Toggle Adjust Framerate
'G'	Dump configuration and trimming register
'h'	pushes binary EEDATA out
'I'	optimizes ratio of refresh rates if Adjust Framerate=1 otherwise dump the stored EEPROM (Sensor) value for ratio of refresh rates
'k'	Read single temperature frame. Output in binary format.
'K'	send continous binary temperature datastream [K*10] Output of a complete cycle in this order: *Pixel0,Pixel1, ….Pixel63, PTAT, TAmb, VDD* ***For a detailed Description of the serial order see Table2.*** One dataset has exactly 2 bytes: first the low-Byte is send, then the high-byte. Each Dataset contains the measured Temperature in Kelvin*10 followed by the PTAT value, the ambient temperature and the current VDD in the MSB's:
'M'	Shows current and calibration settings. Device prints the following stream: **"HTPA series responsed! I am Arraytype 6\r\n"** **"HTPA 16x4 YYYY-MM-DD v.X.XX Heimann Sensor GmbH; written by M. Schnorr"** Version information. **"I am running on XXXX.X Hz"** Actual refresh rate in Hz **"MAC-ID: X IP: Y DevID: Z\r\n"** (Only Ethernet devices show a MAC-ID, DevID is shown in any case) X= MAC-ID of the device, i.e. "00.97.FF.00.10.08"; Y=current IP of the device, Z=user setable ID, range 00000…65535
'p'	Dump EEPROM (Sensor)
'P'	Dump RAM
'r'	Toggle between optimizing trimming value: 1.always 2.only if EEPROM (Sensor) entry is empty 3.never*
'R'	Optimizes trimming value
s	reduces trimming value by one
S	increases trimming value by one
'T'	send continous binary voltage datastream Output of a complete cycle in this order: *Pixel0,Pixel1, ….Pixel63, PTAT, TAmb, VDD* ***For a detailed Description of the serial order see Table2.*** One dataset has exactly 2 bytes: first the low-Byte is send, then the high-byte. Each Dataset contains the measured pixel voltage followed by the PTAT value, the ambient temperature and the current VDD in the MSB's:
'v'	Announce IP (Only Ethernet devices)
'w'	shows Calibration-constants
'W'	Calibration. ATTENTION! Old Dataset (Heimann Sensor calibration) cannot be restored!
'x'	Stops Stream without prompt.
'X'	Stops Stream by sending "STOP!\r\n"

Table1: Control Characters

If *Adjust Framerate* is on, the ratio of the set refresh rate to the refresh rate the sensor actual has will be measured upon power up or by sending 'I'. The result is stored in the EEPROM (Sensor) at address 0xcc (low-Byte) and 0xcd (high-Byte) with a scaling factor of 1000, so a ratio of the refresh rates of e.g. 1.210 will be saved as 1210.

*If desired the trimming value of the sensor will be optimized upon power up. The value will be saved in EEPROM (Sensor) at address 0xf7. The optimization can be chosen to be always done, only if the EEPROM value is empty or never. This can be toggled with 'r'. Sending 'R' will also optimize the trimming value and store the value in the EEPROM.

Serial order in Frame:

HTPA16x4 Temperature Mode	
Dataset	Value
0	Temperature of Pixel0 in K*10
1	Temperature of Pixel1 in K*10
…	…
63	Temperature of Pixel63 in K*10
64	PTAT in digits
65	TAmb
66	VDD

HTPA16x4 Voltage Mode	
Dataset	Value
0	absolute Voltage of Pixel0 in in digits
1	absolute Voltage of Pixel1 in in digits
…	…
63	absolute Voltage of Pixel63 in in digits
64	PTAT in digits
65	TAmb
66	VDD

Table2: Serial order

Each dataset consists of a 16 bit value, first the low-Byte is send, then the high-Byte. The Voltage is send with an electrical offset of +1 V.

Control Messages:

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

[IP]	insert IP in ASCII format, i.e.: *"192.168.240.122"*
[MACID]	insert MAC ID in ASCII format and hexadecimal, i.e.: *"00.1A.22.33.44.55"*
[MCLK]	insert Frequency of refresh rate in ASCII format and Hz, i.e.: *"0016.0"*
[MSK]	insert subnet mask in ASCII format, i.e.: *"255.255.255.000"*
[DEVID]	insert 5 digit device ID in ASCII format, i.e. *"00197"* Range: 00000… 65535

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 responsed! I am Arraytype 6" Firmware version, date and author information. "I am running on **[MCLK]** Hz" "MAC-ID: **[MACID]** IP: **[IP]**\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"

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 **Table 1.**
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 (Module), if packet size is equal to 1024 bytes. Device writes to EEPROM, until EEPROM is completely filled. EEPROM size is 16384 byte.
Answer:	"Write was successful.\n\r"

Message6:	"Set DeviceID to **[DEVID]**"
Result:	The given Device ID **[DEVID]** is written to EEPROM (Module). This ID is shown on receive of 'M'. The eDevice ID can be used for customer specific purposes.
Answer:	"DeviceID changed to **[DEVID]**\r\n"

Temperature calculation:

For temperature calculations of the ambient temperature and the object temperature see datasheet Rev. 5 of the sensor.