# DTPA-UART-1616S

Non-contact 16x16 Pixel Infrared Temperature Sensor

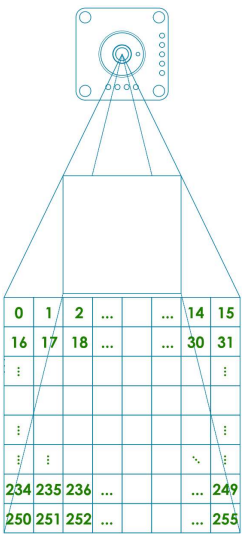
## Product Specifications

laboratory temperature conditions: 25℃.

| Parameter | min | Typ | Max | Unit |
|---|---|---|---|---|
| Supply voltage | 4.5 | 5 | 9 | V |
| Supply current | | 15 | | mA |
| pixels | | 256 | | px |
| Spectral range | 5 | | | ㎛ |
| Object temperature range | -20 | | 200 | ℃ |
| Operating temperature | -20 | | 80 | ℃ |
| IR refresh rate | | 10 | | Hz |
| Accuracy(*) | | ±3 | | % |
| Resolution digital | | 0.1 | | ℃ |
| Emissivity | | 1 | | ε |
| Standard start-up time | | 3 | | sec |
| Stabilization time | 1 | | | min |
| FOV | 44° x 44° | | | |
| Weight (without cable) | 6.3 g | | | |
| Communication interface | UART | | | |
| Relative humidity | 95% Max. non-condensing | | | |

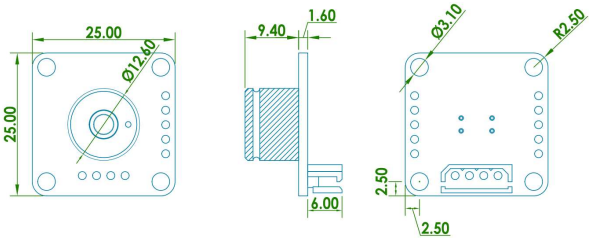
***: ±3% • |To-Ta| of reading or ±3℃ (whichever is greater) for 5℃<Ta<50℃. All accuracy specifications only apply under settled isothermal conditions and specified for the center pixel. Accuracy Measurement Distance: 15cm**

## 16 x 16 Optical Orientation

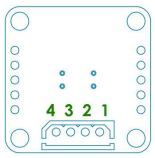



## Dimensions / Pin Configuration

unit: mm




Top view　　Side view　　Bottom view

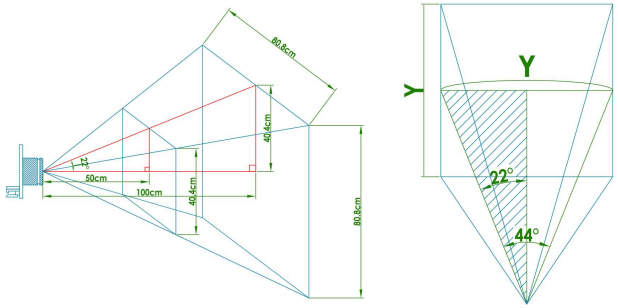
| Bottom view | No. | Name | Description |
|---|---|---|---|
|  | 1 | 5V | supply voltage |
| | 2 | TX | UART Output 3.3V |
| | 3 | RX | UART Input 3.3V (with 5V tolerant) |
| | 4 | GND | ground |



※ Connector information: molex
- pcb side 5267-04A (P/N 22035045)
- mates with 5264-04 (P/N 50375043)

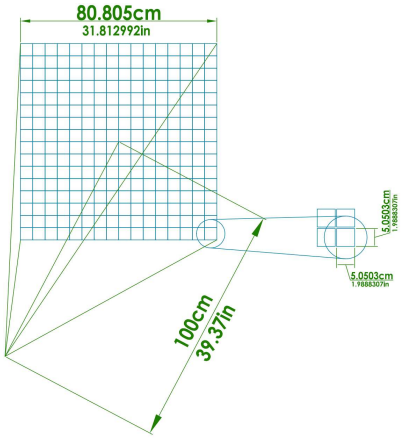
## Calculate Field of View

The FOV determines the size of the infrared measurement area according to the distance.




**Y = distance(cm) x tan( 22 °) x 2**

e.g. Y = 100cm*0.404*2 ≒ 80.8 cm
Y = 200cm*0.404*2 ≒ 161.6 cm




size of 1 pixel (distance: 1m)

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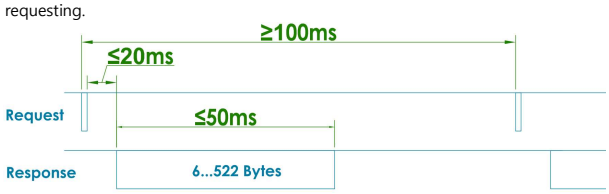
## UART Protocol

- BaudRate: 115,200bps(fixed), data bit: 8, stop bit:1, parity: none, flow control: none
- I/O is 3.3V LV (5V tolerant)

## Timing

- The sensor has a minimum data request cycle of 100ms, which means that you need to wait at least 100ms between each request, regardless of how many data you are requesting.




## UART Data Format

**- request command**

- The frame of request data consists of 6 bytes. The byte structure is explained below. Note that an 'X' refers to a variable bit containing dynamic data.

| Request (main → DTPA) | | | |
|---|---|---|---|
| **Byte** | **Field Name** | **data** | **DEC** |
| 0 | START | 0x11 | 17 |
| 1 | Start Address(MSB) | 0b0000000X | 0...258(*) |
| 2 | Start Address(LSB) | 0bXXXXXXXX | |
| 3 | No. of Register(MSB) | 0b0000000X | 1...259(**) |
| 4 | No. of Register(LSB) | 0bXXXXXXXX | |
| 5 | END | 0x98 | 152 |

(*) Start Address(SA): minimum: 0 maximum: 258

(**) No. of Register(NR) ≤ (259-SA) , minimum:1, maximum: 259

Access to the sensor is limited to the addresses listed in the address map table. Attempting to access any other address will result in no response from the sensor. Please refer to the "Address map" for more information.

e.g. SA:257 NR: 1 (ok)

SA:257, NR: 10 (X) - no response

SA:1, NR: 256 (ok)

SA:1, NR: 270 (X) - no response

The (SA, NR, response data)structure would be: 0x[MSB][LSB], where MSB and LSB are each two hexadecimal numbers (8 bits).

**- response data**

The number of bytes in the response frame varies based on the value of NR.

| Response (DTPA → main) | | | |
|---|---|---|---|
| **Byte** | **Field Name** | **data** | **DEC** |
| 0 | START(MSB) | 0x16 | 22 |
| 1 | START(LSB) | 0x98 | 152 |
| 2 | Temperature of the SA(MSB) | 0xXX | |
| 3 | Temperature of the SA(LSB) | 0xXX | |
| ... | ... | | |
| ... | Temperature of the end address(MSB) | 0xXX | |
| ... | Temperature of the end address(LSB) | 0xXX | |
| ... | END(MSB) | 0x1A | 26 |
| ... | END(LSB) | 0x9C | 156 |

e.g. No. of Register(NR): 2 → total response bytes: (2*2)+4 = 8 bytes

No. of Register: 259 → (259*2)+4= 522 bytes

## Address map

| Address | | Data Length | Type | Description |
|---|---|---|---|---|
| **HEX** | **DEC** | **Short** | | |
| 0x0000 | 0 | 1 | signed | Ambient Temperature(Ta) |
| 0x0001 | 1 | 1 | signed | Temperature of PIXEL 0 |
| 0x0002 | 2 | 1 | signed | Temperature of PIXEL 1 |
| 0x0003 | 3 | 1 | signed | Temperature of PIXEL 2 |
| 0x0004 | 4 | 1 | signed | Temperature of PIXEL 3 |
| : | : | : | : | : |
| 0x00FF | 255 | 1 | signed | Temperature of PIXEL 254 |
| 0x0100 | 256 | 1 | signed | Temperature of PIXEL 255 |
| 0x0101 | 257 | 1 | signed | Maximum temperature |
| 0x0102 | 258 | 1 | signed | Minimum temperature |

The data is in 2's complement format.

- Request command examples:

Read PIXEL 0...256 temperature: 0x11,0x00,0x01,0x01,0x00,0x98 (6-byte)
SA: 1 NR: 256

Read only Max, Min temperature : 0x11,0x01,0x01,0x00,0x02,0x98 (6-byte)
SA: 257 NR: 2

## Temperature Calculation

The result is calculated by following expressions (valid for all temperature):

1. Convert it to decimal value i.e. 0x016D = 365d
2. Multiply by 0.1(or divide by 10) i.e. 365 x 0.1 = 36.5℃

0xFFF1 = -15 → -1.5℃

0xFF9C = -100 → -10.0℃

0x00FF = 255 → 25.5℃

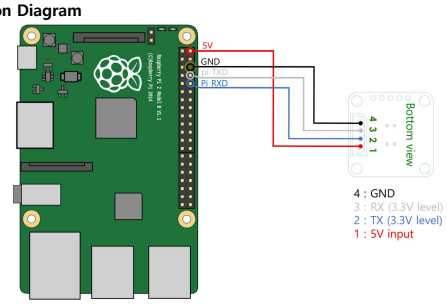
## Tutorial(Raspberry Pi 2)

**- Requirements**

Hardware: Raspberry Pi 2 , DTPA-UART-1616S

Software: wiringPi library

**- Connection Diagram**




**- Sample code**

https://www.diwellshop.com/web/en/DTPA/DTPA-UART-S_raspberryPi.zip

**- Expected Results.**

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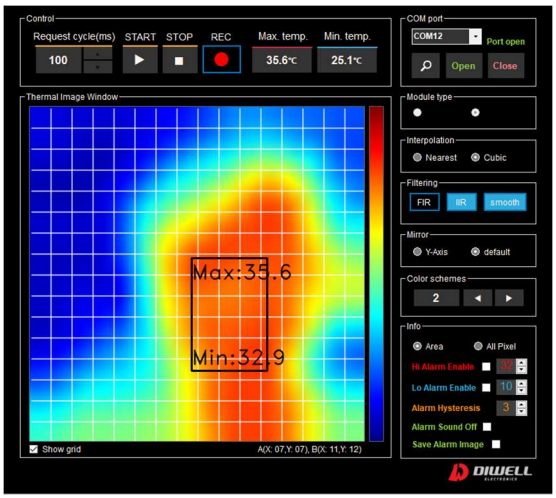
## Products handling precaution

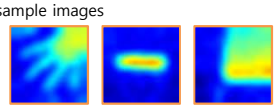
※ Always use the proper power supply and voltage when operating the product. Using an improper power supply can cause damage to the product or create a safety hazard.
※ Don't drop or hit the product, as this can cause physical damage to the product.
※ When not in use, it is recommended to store the product at room temperature and in a dry place
※ To remove dust, use a blower rather than compressed air.
※ Avoid pressing the lens with your hands or any other object.
※ Do not scratch the lens surface with sharp objects.
※ Do not disassemble or modify the product voluntarily.
※ Avoid exposing the product to direct sunlight, chemicals, heat, or fire.
※ This product is not water-resistant.
※ Do not remove the sensor during communication.
※ Do not touch the sensor, heatsink and PCB while measuring temperature.
※ For stable temperature measurement, avoid measuring immediately after turning on the sensor's power. The power must always be supplied and should not be turned on or off during measurement.
※ Placing heating components near the sensor inside the case can affect the accuracy of temperature measurement. It is strongly recommended to isolate them from the sensor if possible

## PC Software

The software runs on Windows 10 environment.
For more information, refer to the Test Board manual.
https://www.diwellshop.com/web/en/DTPA/DTPA-UART-1616S_TestBoard_en.pdf

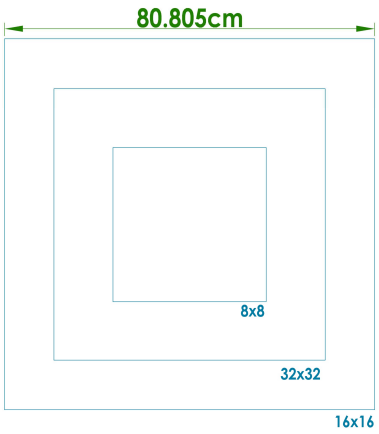



- sample images



## Comparison of measurement areas

When measuring temperature from a distance of 1 meter, the measurement area may vary depending on the module used. Here is a comparison of the measurement areas for each module.




## Additional information

Manufacturer: DIWELL Electronics Co., Ltd. (South Korea)
Technical support: mailto:expoeb2@diwell.com, mailto:dsjeong@diwell.com

## Revision history

| Version | Date(Y,M,D) | Description |
|---|---|---|
| 1.0.0 | 2023. 4. 21. | First version is released |