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# TSEV01S01C05

## SPECIFICATIONS

- **Contact less Temperature Measurement**
- **Small Size**
- **Heat Spreader improves Accuracy**
- **Wide Supply Voltage Range**
- **Digital Interface Bus (SPI)**
- **Connector**
- **Small Field of View**
- **Improved constancy of output signal over distance**

The TSEV01S01C05 is a contact-less temperature measuring system for OEM use based on the detection of infrared radiation.
The TSEV01S01C05 is equipped with an infrared sensor (Thermopile) in front. The Thermopile Sensor has to be pointed at the target object.
The basic working principle is:

- Detection of infrared radiation with a Thermopile sensor, which turns incoming radiation to an analogue voltage
- Determination of sensor temperature using a thermistor
- Calculation of ambient and object temperature using a processing unit
- Providing the ambient and objects temperature at digital output bus (SPI)

The thermopile sensor module is suitable for a wide range of application where non-contact temperature measurement and high accuracy are required.

## FEATURES

0°C – 300°C Measurement Range
Small Size
Up to 2°C Accuracy
2mA Current Consumption
Improved constancy of output signal over distance

## APPLICATIONS

Contact less Temperature Measurement
Climate Control
Industrial Process Control
Household Applications

## ABSOLUTE MAXIMUM RATINGS

Absolute maximum ratings are limiting values of permitted operation and should never be exceeded under the worst possible conditions either initially or consequently. If exceeded by even the smallest amount, instantaneous catastrophic failure can occur. And even if the device continues to operate satisfactorily, its life may be considerably shortened.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | Vccmax | Stabilized supply voltage | -0.3 | | +16 | V |
| Operating Temperature | Topmax | | -10 | | +85 | °C |
| Storage temperature | Tstor | | -40 | | +85 | °C |
| Humidity | HumL | -40°C - +50°C | | | 85 | % |
| Humidity | HumH | +50°C - +85°C | | | 50 | % |

## OPERATING CONDITIONS

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | Vcc | Stabilized supply voltage | +3.3 | | +16 | V |
| Operating Temperature Range | Top | | -10 | | +85 | °C |
| Emission Coefficient | ε | | 0.98 | | | |

## SENSOR CONDITIONS

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Field of View | FOV 10 | Total field of view at 10% signal level | | 8 | | ° |
| Field of View | FOV 50 | Total field of view at 50% signal level | | 5 | | ° |
| Wavelength Range | S | | Silicon, no coating | | | µm |

## OPERATIONAL CHARACTERISTICS

If not otherwise noted, 5V supply voltage and object with ε =0.98 were applied.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Object Temperature Range | Tobj | | 0 | | 300 | °C |
| Resolution | Res | | | | 0.1 | °C |
| Supply Current[1)] | I | No output load | | 2 | | mA |
| Data Output Rate | Fout | | | 1 | | Hz |
| Standard Start-Up Time | tStart | | | | 3 | s |

## TOLERANCES

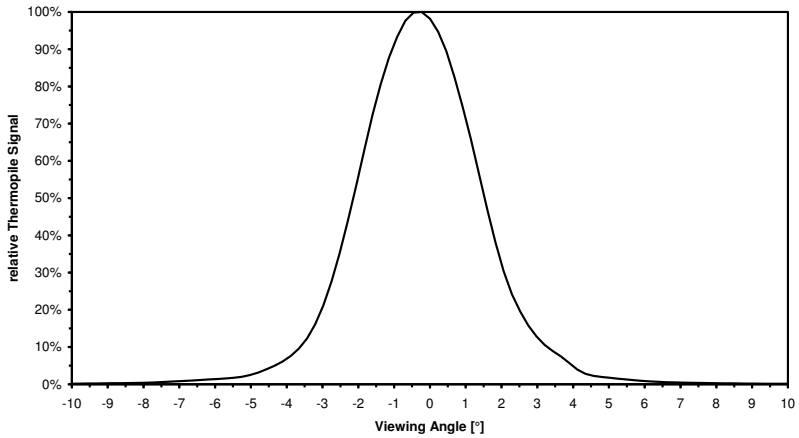
If not otherwise noted, 5V supply voltage and object with ε =0.98 were applied.

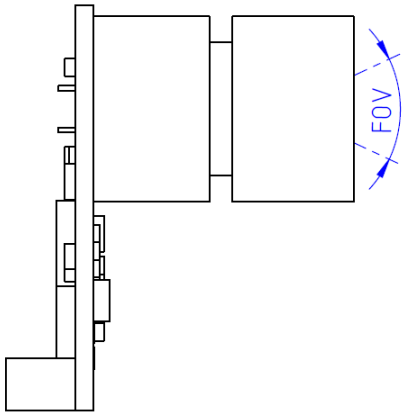
| Parameter | Symbol | Sensor Temp. | Object Temp. | Max | Unit |
|---|---|---|---|---|---|
| Standard Temp [1) 3)] | AccS | $15 < T_{sen} < 35$ | $160 < T_{obj} < 200$ | 2 | °C |
| Extended Temp. 1 [2) 3)] | AccE1 | $T_{sen} < 15, T_{sen} > 35$ | $160 < T_{obj} < 200$ | 3 | °C |
| Extended Temp. 2 [2) 3)] | AccE2 | $15 < T_{sen} < 35$ | $T_{obj} < 160, T_{obj} > 200$ | 3 | °C |
| Extended Temp. 3 [2) 3)] | AccE3 | $T_{sen} < 15, T_{sen} > 35$ | $T_{obj} < 160, T_{obj} > 200$ | 4 | °C |

**OTHER TEMPERATURE RANGES AND ACCURACIES ARE AVAILABLE ON REQUEST.**

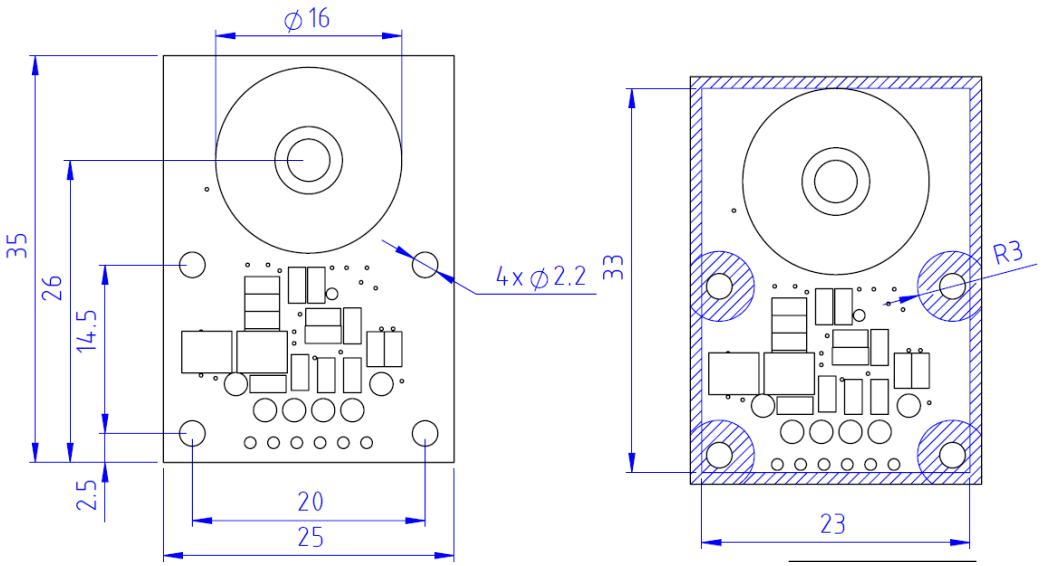
1) Proved while production
2) Proved by design
3) Valid for a distance of 100mm and black body size of 150mm x 150mm

## SENSOR FIELD OF VIEW

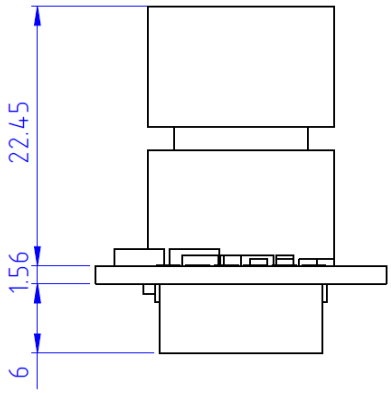


## Mechanical Dimensions



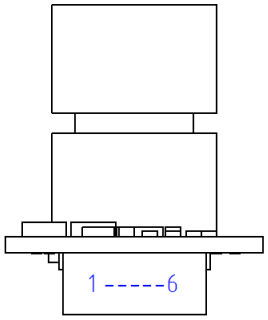

Only use hatched areas for mechanical assembly (screws, nuts, etc).



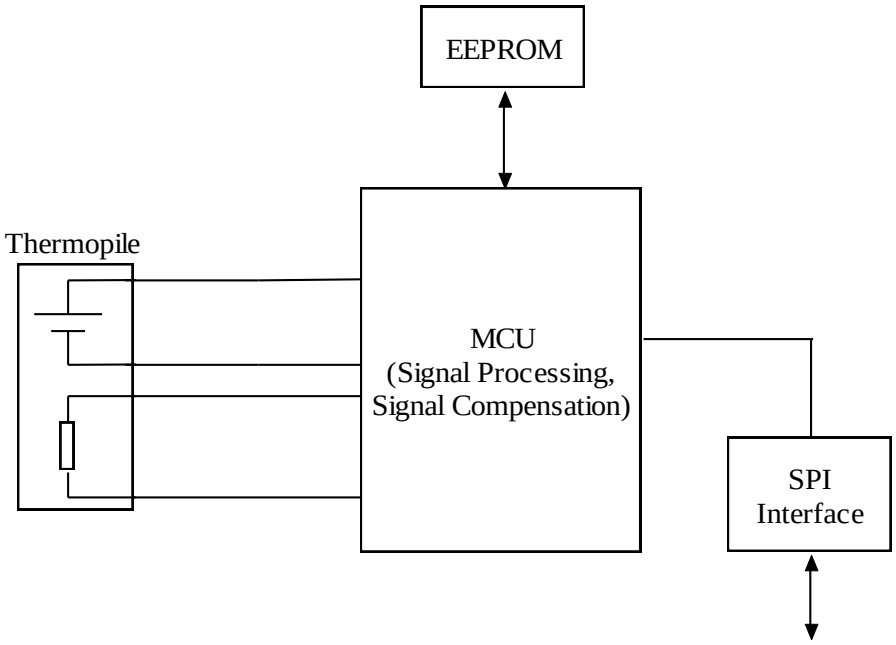

## TERMINALS

Connector: JST PHR-6

| Pin | Name | Description | Type |
|---|---|---|---|
| 1 | VDD | Supply Voltage | Supply |
| 2 | GND | Ground | Supply |
| 3 | SCL | SPI Clock | Interface |
| 4 | MISO | SPI Master In / | Interface |
| 5 | MOSI | SPI Master Out / | Interface |
| 6 | SCE | SPI Chip Enable | Interface |



## BLOCK DIAGRAM



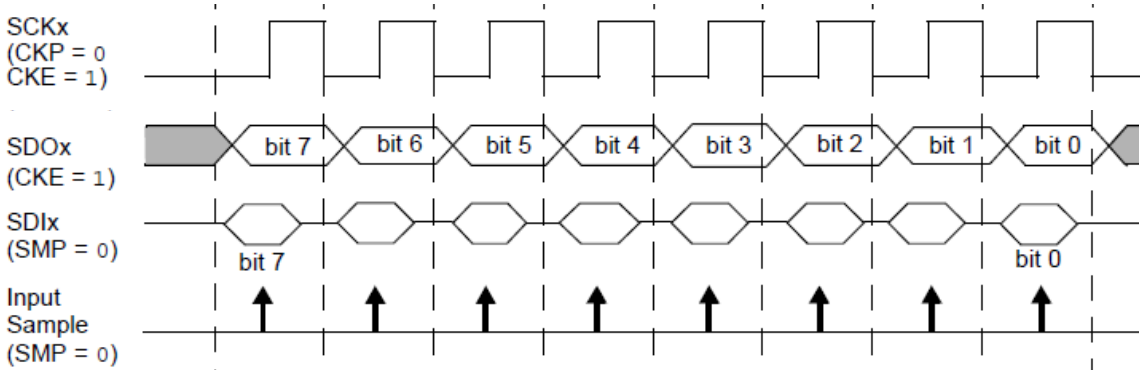

## INTERFACE

### PARAMETER

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Baudrate | FSPI | | 10 | | 100 | kHz |
| Data Bits | | | | 8 | | |
| Chip Select | | | | Yes | | |
| Input Voltage Low | | | | | 0.9 | V |
| Input Voltage High | | Vcc = 3.3V | 2.1 | | | V |
| Output Voltage Low | | 1mA | | | 0.3 | V |
| Output Voltage High | | Vcc = 3.3V, 1mA | 3.0 | | | V |

### SIGNAL DESCRIPTION

- SCE (Chip Select) 0 = Enable, 1 = Disable
- CKP 0
- CKE 1



### SAMPLE CODE

Sample Code for sending 8 bits and reading 8 bits while sending 8 clocks.

```
/ /  Setting directions
        TRISC4 = 1;        // SDI = Input
        TRISC5 = 0;        // SDO = Output
        TRISC3 = 0;        // SCL = Output
// Reset SPI Lines
        RC5 = 0;// SDO
        RC3 = 0;// SCL
        for (c = 0; c < 8; c++)
        {
                cReceive = cReceive << 1;          // Shift Receive Register
                RC3 = 0;                           // SCL = 0
                RC5 = (cTransmit >> (7 - c));      // Outupt next Bit on SDO
                RC3 = 1;                           // SCL = 1
                cReceive = cReceive | RC4;                 // Input next Bit on SDI
        }
        RC3 = 0;
        RC5 = 0;
return cReceive;
```

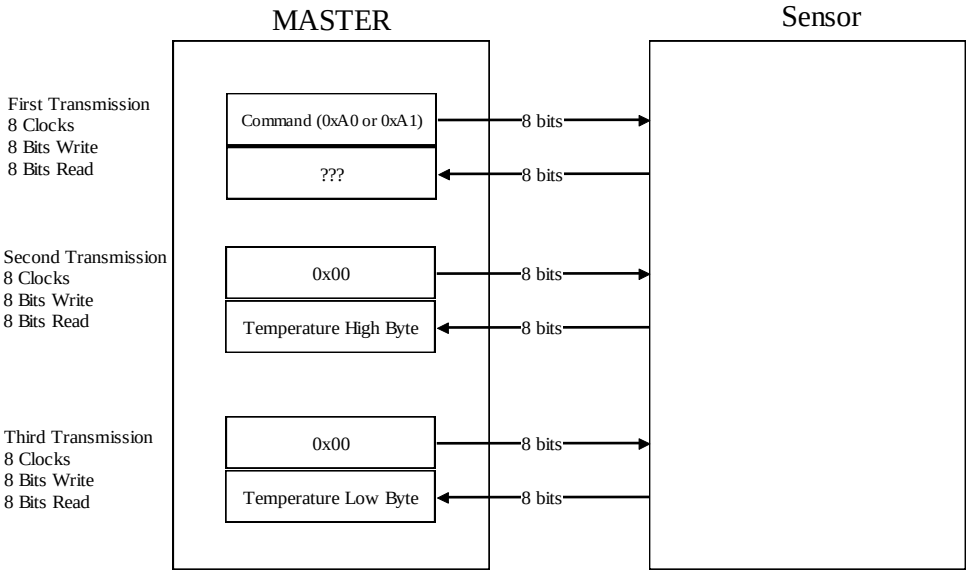
## AMBIENT AND OBJECT TEMPERATUREMEASUREMENT

Please refer following table for SPI commands to read object temperature and ambient temperature. Both values are transmitted in hundredth of degrees.

| Com | Description | Reply | Bytes |
|---|---|---|---|
| 0xA0 | Sensor Temperature | Sensor temperature in hundredth of degrees Celsius | 2 |
| 0xA1 | Object Temperature | Object temperature in hundredth of degrees Celsius | 2 |

### SEQUENCE OF TRANSMISSION

Enable SCE (SCE=0) before transmission of “Command”. Release SCE (SCE=1) after reading last byte.



**EXAMPLE OF TEMPERATURE CALCULATION**

For reading object temperature send: 0xA1

Return values i.e.:

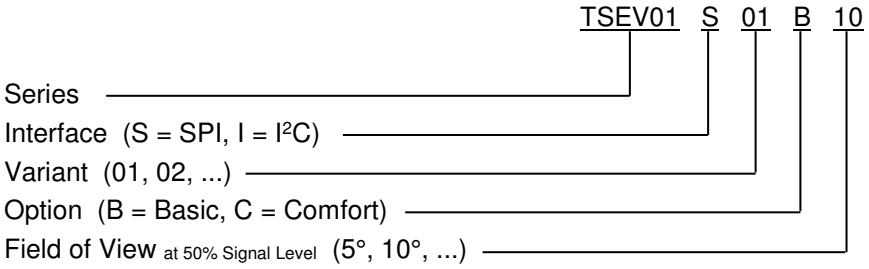
Byte(0) = ??? discard reading

Byte(1) = 0x1A (=26)

Byte(2) = 0xB0 (=176)

Tobj = (256 * Byte(1) + Byte(2)) / 100 = (256 * 26 + 176) / 100 = 68.32°C

## NAMING CONVENTION




## ORDER INFORMATION

Please order this product using following:

| Part Number | Part Description |
|---|---|
| G-TPMO-025 | TSEV01S01C05 |

## EMC

Due to the use of these modules for OEM application no CE declaration is done.

Especially line coupled disturbances like surge, burst, HF etc. cannot be removed by the module due to the small board area and low price feature. There is no protection circuit against reverse polarity or over voltage implemented.

The module will be designed using capacitors for blocking and ground plane areas in order to prevent wireless coupled disturbances as good as possible.

## Definitions and Disclaimers

- Application information – Applications that are described herein for any of these products are for illustrative purpose only. MEAS Deutschland GmbH makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.
- Life support applications – These products are not designed for use in life support appliances, devices, or systems where malfunctions of these products can reasonably be expected to result in personal injury.
  MEAS Deutschland GmbH customers using or selling this product for use in such applications do so at their own risk and agree to fully indemnify MEAS Deutschland GmbH for any damages resulting from such improper use or sale.

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