



## TSEV01C01C10

### THERMOPILE SENSOR MODULE

#### Product Description

TSEV01C01C10 is a contact-less temperature measuring system for OEM use based on the detection of infrared radiation. TSEV01C01C10 is equipped with an infrared sensor (Thermopile) in front. The Thermopile Sensor has to be pointed at the target object of interest.

- 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 via I<sup>2</sup>C bus

The TSEV01C01C10 is suitable for a wide range of application where non-contact temperature measurement is required.

#### Features

- 0°C ... +300°C measurement range
- Small field of view
- 4V ... 16V supply voltage range
- Up to 1.5% accuracy
- I<sup>2</sup>C Interface
- 2mA current consumption

#### Applications

- Contactless 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. Even if the device continues to operate satisfactorily, its life may be considerably shortened.

| Parameter             | Symbol     | Condition | Min            | Typ | Max | Unit |
|-----------------------|------------|-----------|----------------|-----|-----|------|
| Supply voltage        | $V_{DD}$   | ---       | -0.3           | --- | +16 | V    |
| Operating temperature | $T_{op}$   | ---       | -10            |     | 85  | °C   |
| Storage temperature   | $T_{stor}$ | dry       | -10            | --- | +85 | °C   |
| Humidity              | Hum        | ---       | Non condensing |     |     | ---  |

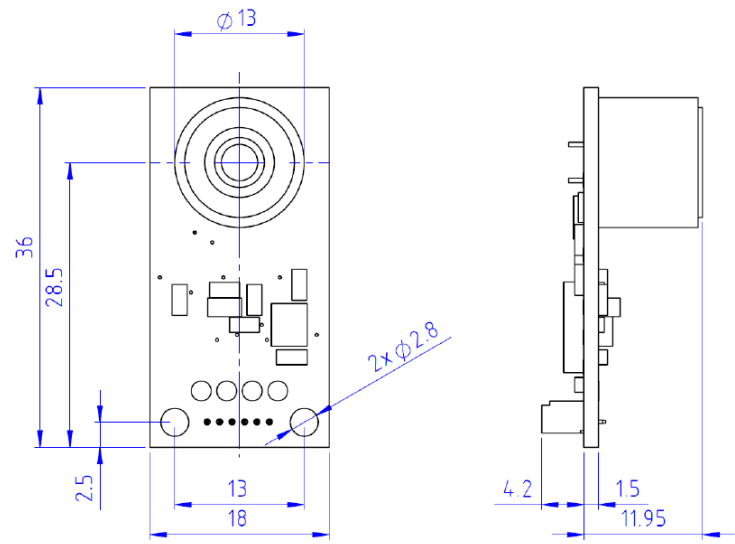
## OPERATING CONDITIONS

If not otherwise noted, 25°C ambient temperature, 5V supply voltage and object with  $\epsilon = 0.98$  were applied.

| Parameter                                                                                       | Symbol            | Condition                                   | Min  | Typ                | Max  | Unit |
|-------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------|------|--------------------|------|------|
| Operating supply voltage                                                                        | $V_{DD}$          | stabilized                                  | 4    | 5                  | 16   | V    |
| Emission Coefficient                                                                            | E                 | ---                                         | 0.95 | ---                | ---  |      |
| Object Temperature Range                                                                        | $T_{obj}$         | ---                                         | 0    | ---                | +300 | °C   |
| Ambient Temperature Range                                                                       | $T_{amb}$         | ---                                         | 0    | ---                | +100 | °C   |
| Resolution                                                                                      | Res               | ---                                         | ---  | ---                | 0.1  | °C   |
| Field of View                                                                                   | FOV <sub>10</sub> | Total FOV at 10% signal level               | ---  | 14                 | ---  | °    |
| Field of View                                                                                   | FOV <sub>50</sub> | Total FOV at 50% signal level               | ---  | 10                 | ---  | °    |
| Supply Current                                                                                  | I                 | Full ambient temp. range,<br>no output load | ---  | 2                  | ---  | mA   |
| I2C Baudrate                                                                                    | $F_{I2C}$         | ---                                         | 10   | ---                | 100  | kHz  |
| Data Output Rate                                                                                | $F_{out}$         | ---                                         | ---  | 1                  | ---  | Hz   |
| Standard Start-Up Time                                                                          | $t_{Start}$       | ---                                         | ---  | ---                | 3    | s    |
| Accuracy tolerance when<br>10°C < $T_{amb}$ < 40°C<br>and after 3 minutes stabilization<br>time | $\Delta T$        | 170°C < $T_{object}$ < 190°C                | ---  | ±1.5 <sup>1)</sup> | ---  | %FS  |
|                                                                                                 |                   | Outside above range                         | ---  | ±2.5 <sup>1)</sup> | ---  | %FS  |

<sup>1)</sup> Valid for a distance of 100mm and black body size of 150mm x 150mm.

**MECHANICAL DIMENSIONS**

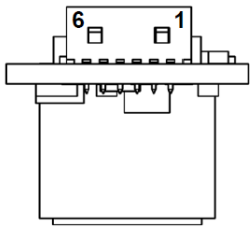


Units: mm

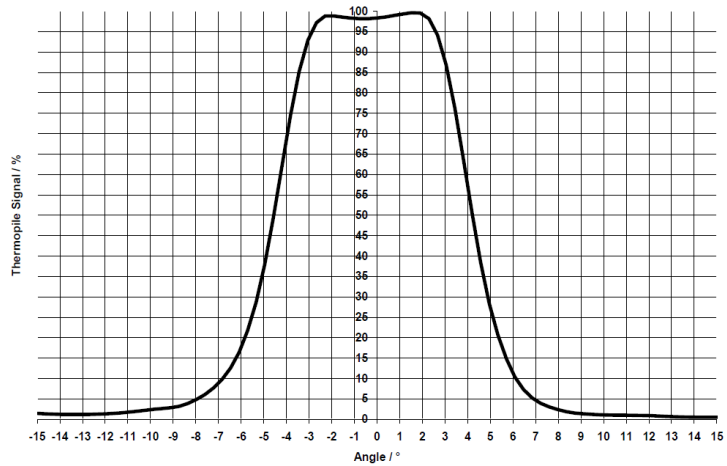
**TERMINALS**

Mating Connector: Molex 51021-0600

| Pin | Name            | Description                   | Type      |
|-----|-----------------|-------------------------------|-----------|
| 1   | NC              | ---                           | ---       |
| 2   | NC              | ---                           | ---       |
| 3   | SDA             | I <sup>2</sup> C Data (3.6V)  | Interface |
| 4   | SCL             | I <sup>2</sup> C Clock (3.6V) | Interface |
| 5   | GND             | Ground                        | Supply    |
| 6   | V <sub>CC</sub> | Supply Voltage (5V)           | Supply    |

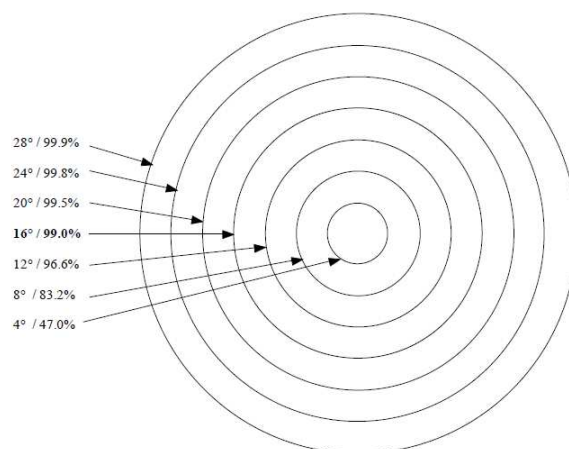


**FIELD OF VIEW**



## SIGNAL DISTRIBUTION

The non-ideal filter characteristics have to be considered for the correct measurement distance with respect to the measurement object surface size. To achieve most accurate measurement results, measurement object should at least cover 99% of the sensors field of view.



## I2C INTERFACE

The typical baud rate of this device is 100kBit/s. The supported address length is seven bits. The I<sup>2</sup>C slave address is 54h. Pull-up resistors of 10kOhm are provided on the board.

## PHYSICAL INTERFACE PARAMETERS

| Parameter          | Symbol | Condition | Min | Typ    |
|--------------------|--------|-----------|-----|--------|
| Baudrate           | 10     | ---       | 100 | kBit/s |
| Address length     | ---    | 7         | --- | Bit    |
| Address (standard) | ---    | 54h       | --- | ---    |
| Input High Level   | 2      | ---       | 3.6 | V      |
| Input Low Level    | ---    | ---       | 1   | V      |
| Output High Level  | 2.5    | ---       | --- | V      |
| Output Low Level   | ---    | ---       | 1   | V      |

## I<sup>2</sup>C COMMAND REFERENCE

### AMBIENT AND OBJECT MEASUREMENT

Please refer following table for I<sup>2</sup>C commands to read object temperature and ambient temperature. Both values are transmitted in hundredth of degrees.

| Command | Description              | Reply                                      | Bytes |
|---------|--------------------------|--------------------------------------------|-------|
| 0xB6    | Read object temperature  | Object temperature in hundredth of degree  | 2     |
| 0xB5    | Read ambient temperature | Ambient temperature in hundredth of degree | 2     |

### EXAMPLE OF TEMPERATURE CALCULATION

Send command (read object temp.): 0xB6  
 Return values i.e.: Byte(0) = 0x0E, Byte(1) = 0xAA  
 Temperature calculation:  $T_{obj} = (256 * \text{Byte}(0) + \text{Byte}(1)) / 100 = (256 * 14 + 170) / 100 = 37.54^{\circ}\text{C}$

### OUT OF RANGE INDICATION

In case of ambient or object temperature over exceeding specified temperature ranges temperature outputs showing following data:

| Command | Description                 | Reply   | Bytes |
|---------|-----------------------------|---------|-------|
| 0xB6    | Object temperature > 300°C  | 0xFFFF0 | 2     |
| 0xB6    | Object temperature < 0°C    | 0xFFFF1 | 2     |
| 0xB5    | Ambient temperature > 100°C | 0xFFFFF | 2     |
| 0xB5    | Ambient temperature < 0°C   | 0xF000  | 2     |

## READING TEMPERATURE

i.e. object temperature.

### WRITE SEQUENCE

| Data                                              | Direction      |
|---------------------------------------------------|----------------|
| Start, Address (Write 0x54), Command (0xB6), Stop | Master → Slave |

### READ SEQUENCE

| Data                                 | Direction      |
|--------------------------------------|----------------|
| Start, Address (Read 0x55)           | Master → Slave |
| Read data (high byte of temperature) | Master ← Slave |
| Read data (low byte of temperature)  | Master ← Slave |
| Stop                                 | Master → Slave |

## ORDER INFORMATION

Further customer specific adaptations are available on request. Please refer to the table below for part name, description and order information.

| Part Number | Part Description | Comment                                                       |
|-------------|------------------|---------------------------------------------------------------|
| G-TPMO-026  | TSEV01C01C10     | Thermopile Module, I <sup>2</sup> C Interface, 0°C ... +300°C |

## 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.

### NORTH AMERICA

Measurement Specialties, Inc.,  
a TE Connectivity Company  
1711 139th Lane NW  
Andover, MN 55304  
Tel: +1 763 689 4870  
Fax: +1 763 689 5033

customercare.ando@te.com

### EUROPE

TE Connectivity Sensors Germany GmbH

Hauert 13

44227 Dortmund  
Germany  
Tel: +49-231-9740-0  
Fax: +49-231-9740-20

CustomerCare.dtmtd@te.com

### ASIA

Measurement Specialties (China), Ltd.,  
a TE Connectivity Company  
No. 368 Wulian 1st Road  
Gongxing Town  
Shuangliu, Chengdu  
Sichuan, 610200  
China  
Tel: +86 (0) 28 8573 9088  
Fax: +86 (0) 28 8573 9070

customercare.chdu@te.com

### [te.com/sensorsolutions](http://te.com/sensorsolutions)

Measurement Specialties, Inc., a TE Connectivity company.

Measurement Specialties, MEAS, TE Connectivity, TE Connectivity (logo) and EVERY CONNECTION COUNTS are trademarks. All other logos, products and/or company names referred to herein might be trademarks of their respective owners.

The information given herein, including drawings, illustrations and schematics which are intended for illustration purposes only, is believed to be reliable. However, TE Connectivity makes no warranties as to its accuracy or completeness and disclaims any liability in connection with its use. TE Connectivity's obligations shall only be as set forth in TE Connectivity's Standard Terms and Conditions of Sale for this product and in no case will TE Connectivity be liable for any incidental, indirect or consequential damages arising out of the sale, resale, use or misuse of the product. Users of TE Connectivity products should make their own evaluation to determine the suitability of each such product for the specific application.

© 2016 TE Connectivity Ltd. family of companies All Rights Reserved.