Datasheet

TSE64

Thermopile Temperature Sensor

TO-39 Package

Features

- Non-contact surface temperature measure.
- To housing with an F5.5 infrared filter.
- Using IC for ambient temperature compensation.
- Suitable for human body temperature detecting and Industrial temperature measurement.
- 24bit ADC and High sensitivity.
- I2C interface with standard and fast mode.
- Wide range operation voltage (3.0V to 5. 5V) and low power consumption (200nA).
- Operate over an extended temperature range of -40 °C to +125 °C.
- High sensitivity,standard accuracy of ±2% .

Applications

- Non-contact infrared thermometer
- Automatic induction equipment
- Heating, Ventilation and Air Conditioning (HVAC)
- Appliance

Descriptions

The TSE64 is a digital interface thermopile temperature sensor based on MEMS (Micro-ElectroMechanical Systems) technology. This thermopile detector consists of a thermopile MEMS chip, silicon filter, a mixed signal processor IC and a small size TO-39 package.

1 PACKAGE PIN CONFIGURATIONS

Table 1 Pin Names and Description

Pin	Function	Description
1	VCC	External power supply pin.
2	SDA	IIC serial data pin.
3	SCL	IIC serial clock pin.
4	GND	Ground pin.

Figure 1 Thermopile TSE64

Outline of Sensor Package

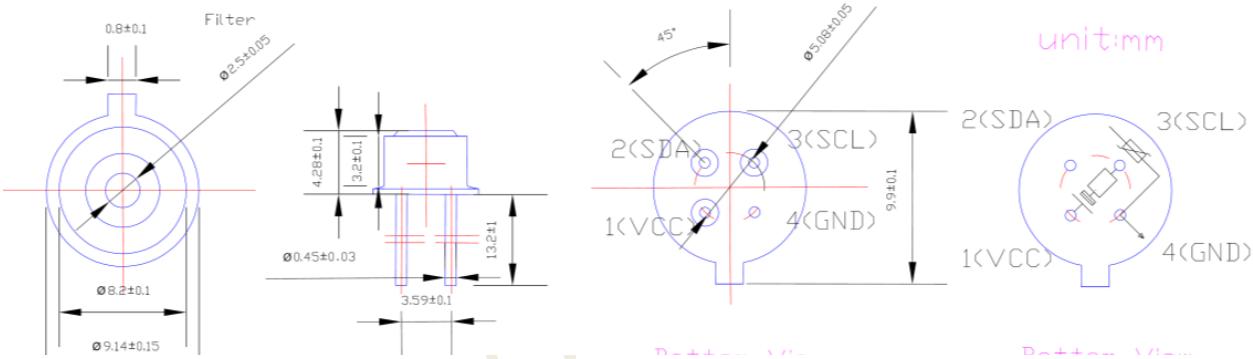

Figure 2 Outline of Sensor Package

Sensitivity Output Curve

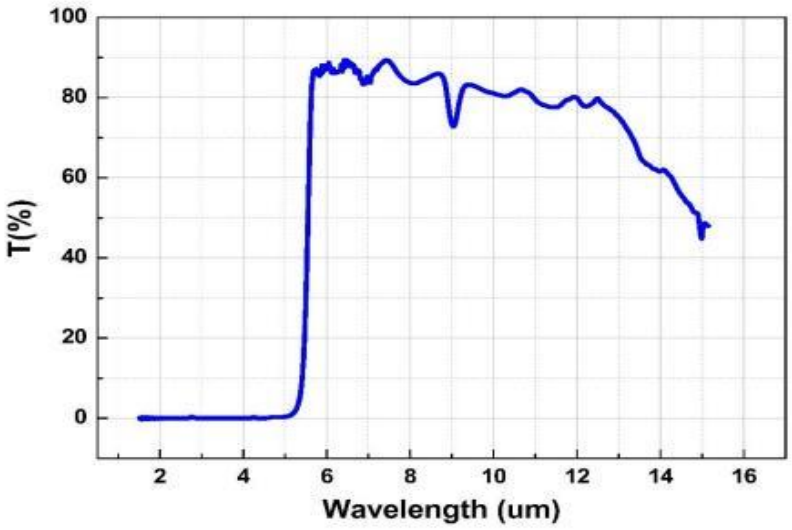

Figure 3 Filter Transmission Curve

2 SPECIFICATIONS AND I/O CHARACTERISTICS

Table 2 Absolute Maximum Ratings

Parament	Min	Type	Max	Unit
Supply Voltage (VDD)	-0.3		4.2	V
Digital output voltage	-0.3		VDD+0.3	V
ESD Susceptibility (HBM)	-2		2	KV
Storage temperature	-40		125	℃

Table 3 Specifications

Parameter	Symbol	Min	Type	Max	Unit
Supply Voltage	VDD	2.3	3.3	3.6	V
Operation temp	Ta	-40		125	℃
Supply Current	IDD		507	800	uA
Sleep Mode current	I		5		uA
ADC Resolution	N		24		Bits
Gain setting	GAIN	8		128	
Field of View	FOV		78		Deg
Power Supply Rejection	PSRR	90	120		dB

3 RECOMMENDED EXTERNAL CONNECTION

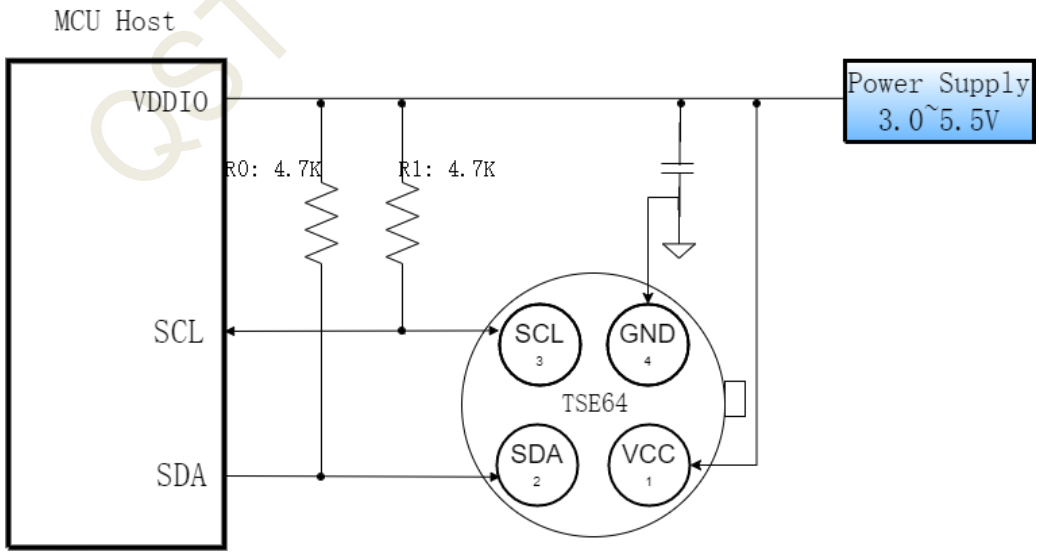

Figure 3 I2C Bus Recommended Connection

4 I2C COMMUNICATION PROTOCOL

I2C bus uses SCL and SDA as signal lines. Both lines are connected to VDDIO externally via pull-up resistors, so that they are pulled high when the bus is free. The I2C device address of TSE64 is 0x7F(7 bit) shown below.

Table4 I2C Address.

A7	A6	A5	A4	A3	A2	A1	WR
1	1	1	1	1	1	1	0/1

Table5 Electrical specification of the I2C interface pins

Symbol	Parameter	Min	Max	Unit
f_{scl}	Clock frequency		400	KHz
t_{low}	SCL low pulse	1.2		us
t_{high}	SCL High pulse	0.7		us
t_{sudat}	SDA setup time	0.1		us
t_{hddat}	SDA hold time	0.0		us
t_{susat}	Setup Time for a repeated start condition	0.6		us
t_{hdsta}	Hold time for a stop condition	0.6		us
t_{susto}	Setup time for a stop condition	0.6		us
t_{buf}	Time before a new transmission can start	1.3		us

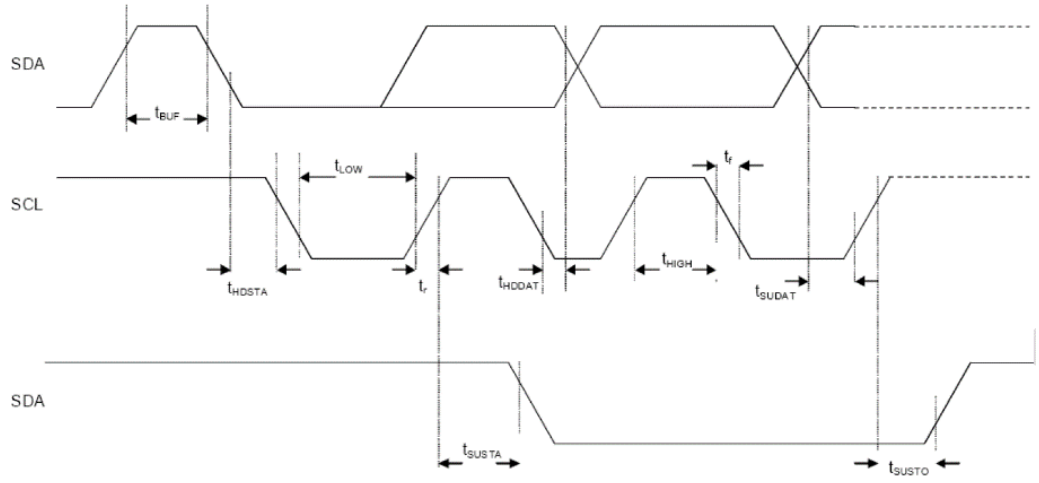

Figure 4 I2C Timing Diagram

The I2C interface protocol has special bus signal conditions. Start (S), stop (P) and binary data condition are shown below. At start condition, SCL is high and SDA has a falling edge. Then the slave address is sent. After the 7 address bits, the direction control bit R/W selects the read or write operation. When a slave device recognizes that it is being addressed, it should acknowledge by pulling SDA low in the ninth SCL (ACK) cycle.

At stop condition, SCL is also high, but SDA has a rising edge. Data must be held stable at SDA when SCL is high. Data can change value at SDA only when SCL is low.

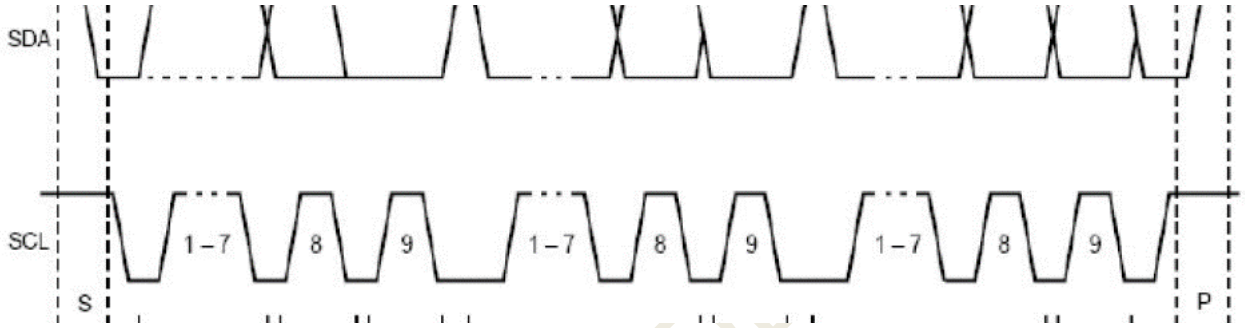

Figure 5 I²C Protocol

Table 6. Abbreviation

SACK	Acknowledged by slave
MACK	Acknowledged by master
NACK	Not acknowledged by master
RW	Read/Write

Table 7. I²C Write

START	Slave Address							R W	SACK	Register Address (0x30)								SACK	Data (0x01)								SACK	STOP
	1	1	1	1	1	1	1	0		0	0	1	1	0	0	0	0		0	0	0	0	0	0	0	1		

Table 8. I²C Read

START	Slave Address							R W	SACK	Register Address (0x02)								SACK
	1	1	1	1	1	1	1	0		0	0	0	0	0	0	1	0	

START	Slave Address							R W	SACK	Data (0x0b)								NACK	STOP
	1	1	1	1	1	1	1	1		0	0	0	0	1	0	1	1		

5 REGISTER

Table 9. Register Map

Addr.	Description	Access	POR /Soft Reset
02H	Status register	R	00H
10H	Object temperature output Register HSB[23:16]	R	00H
11H	Object temperature output Register MSB[15:8]	R	00H
12H	Object temperature output Register LSB[7:0]	R	00H
16H	Ambient temperature output Register HSB[23:16]	R	00H
17H	Ambient temperature output Register MSB[15:8]	R	00H
18H	Ambient temperature output Register LSB[7:0]	R	00H
30H	Measure control Register	R/W	00H

Table 9. Status Registers 0x02:

Addr.	7	6	5	4	3	2	1	0
02H	-	-	-	-	OBJ_DRDY	-	-	AMBIENT_ DRDY

AMBIENT_DRDY

'0': Ambient temperature new data is not ready, '1': Ambient temperature new data is ready.

OBJ_DRDY

'0': Object temperature new data is not ready, '1': Object temperature new data is ready.

Measure control Registers 0x30:

To start measure, First Write 0x01 to 0x30 then Write 0x09 to 0x30.

Object temperature output Register 0x10 0x11 0x12:

24 bits, highest bit is sign bit, data, Format in complement form.

Formula : OBJECT-T(℃) = RAW/16384

Ambient temperature output Register 0x16 0x17 0x18:

24 bits, highest bit is sign bit, data, Format in complement form.

Formula : Ambient-T(℃) = RAW/16384