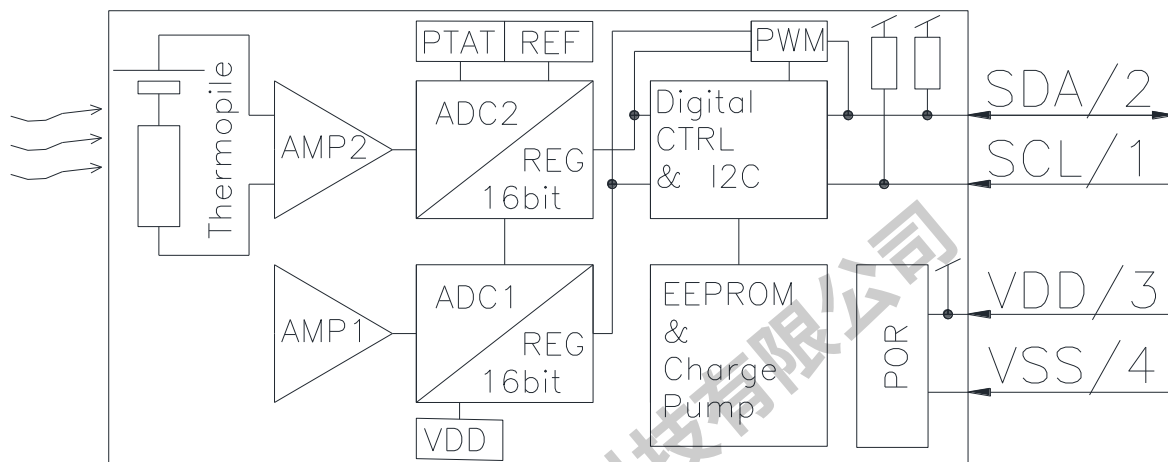


Features and Benefits

- 8..16 bit digital thermopile value and on chip temperature reference on I2C output
- Preamplified thermopile voltages configurable with gain 12.5/25/50/100
- High conversion speed from 0.1ms to 13ms with low to high ADC resolution
- Operating range 3.0V to 3.6V , -20°C to 100°C
- Low current consumption below 500µA, standby mode max. 1µA

Functional Description



The voltage of the thermopile elements will be pre-amplified by means of a very low noise (chopper stabilized) amplifier and feed to an integrating Delta-Sigma-ADC. There will be one ADC per channel operating simultaneously. These ADCs can be used also to measure the on-chip temperature by sampling a PTAT voltage or to measure the supply voltage.

A digital state machine controls the configuration of the chip, the ADC operation and communicates the measured data via a digital communication interface (I2C) to a connected microcontroller. In a special mode it is possible to switch the PWM output of one ADC to the SDA pad.

The chip will be clocked through the internal oscillator. This clock source can be trimmed. During sleep mode the clock generator will be switched off.

An on-chip EEPROM is read-/writeable through the serial interface to store trim and calibration data.

The operation of the chip, selection of multiplexers, storing of measured data, accessing EEPROM and

communication via serial interface is controlled by the integrated state machine.

After power-up (power-on-reset) the state machine sets all analog blocks into standby / sleep mode and stops working. During sleep mode the internal clock is disabled. An externally connected µController can set the configuration registers and start / stop operation of the chip.

A two wire I2C protocol is used to send/receive data. The chip operates always in slave mode. An external µController initiates a data transmission by generating the I2C start / stop condition. Both I2C pads are pulled to VDD by means of an internal pull up resistor. If the external load capacitance at these lines is too high, the resistor must be lowered by adding some external resistors.

The non-volatile memory (EEPROM) can be used to store trim or calibration data. It can store up to 64x16 bit. The memory can be read or written through the I2C interface.

Absolute Maximum Ratings

Parameter	Min to Max Value	Unit	Condition
Supply voltage	-0.3 tp +3.6	V	
Current into any pin	-100 to 100	mA	One pin at a time
Storage temperature	-45 to +125	°C	

**Operating Conditions / Electrical Characteristics
(Ta=25°C, unless otherwise stated)**

Parameter	Typical Value	Unit	Condition
Absorbing Area	1.2 x 1.2	mm²	TP Chip
Sensitivity	38	V/W	TP Chip
Voltage Response	55	Vmm²/W	TP Chip
Time Constant	8	ms	TP Chip ; $\tau = 1-1/e \sim 63\%$
Operating Voltage V _{DD}	(3.0) .. 3.3 .. (3.6)	V	+Vs
Supply Voltage V _{SS}	0	V	-Vs , Ground
Supply Current I _{DD}	500	µA	at V _{DD} =3.3V
Standby Current	1	µA	
Clock Frequency (internal)	0.5..2	MHz	can be trimmed
Preamplifier Gain	12.5/25/50/100	V/V	configurable
Preamplifier input Noise	50	nV /√Hz	at 40kHz
PSRR	60	dB	f= 1 kHz
ADC resolution	6.09 / 0.38 / 0.024 (8 / 12 / 16)	mV bit	@ ADC input range 870mV
Sensitivity Temperature Reference	1.85 320	mV/K LSB/K	typical @ ADC range 190mV
Linearity of Temp. Reference	50	ppm/K	
Conversion Speed	0.1 / 1 / 13 (8 / 12 / 16 Bit)	ms	
I2C clock frequency	(max) 400	kHz	maximum
POR delay	100	µs	
Operating temperature TOP	-20 .. 100	°C	Storage -40..125°C

The resistance of the pull-up resistor can be set in a range from 10kOhm to 1MOhm by setting a configuration register. The SDA pad can be used to generate an interrupt to the µController, if a conversion has been finished. This is done by pulling down SDA, as long as SCL is held high. The pad SDA can be configured to provide the PWM signal of either first or second ADC. In this mode the ADCs will operate continuously. To enable the I2C communication after entering the PWM mode, SCL must be pulled down for a certain time (> 100ns).

I2C Communication

A two wire I2C protocol is used to send/receive data. The chip operates always in slave mode. An external μ Controller initiates a data transmission by generating the I2C start / stop condition. Both I2C pads are pulled to VDD by means of an internal pull up resistor. If the external load capacitance at these lines is too high, the resistor must be lowered by adding some external resistors.

The chip uses the 7-bit I2C address 1xx1010b for accessing configuration and sensor data and the address 1xx1011b to read / write the EEPROM. There will be two hardware address select lines to connect up to 4 chips to the same I2C bus. With these lines the bits A5 and A4 of the I2C address can be set.

The address byte is followed by an 8-bit command. In case of a write access to an internal register the command is followed by the data byte. The chip acknowledges each byte with a low active ACK bit.

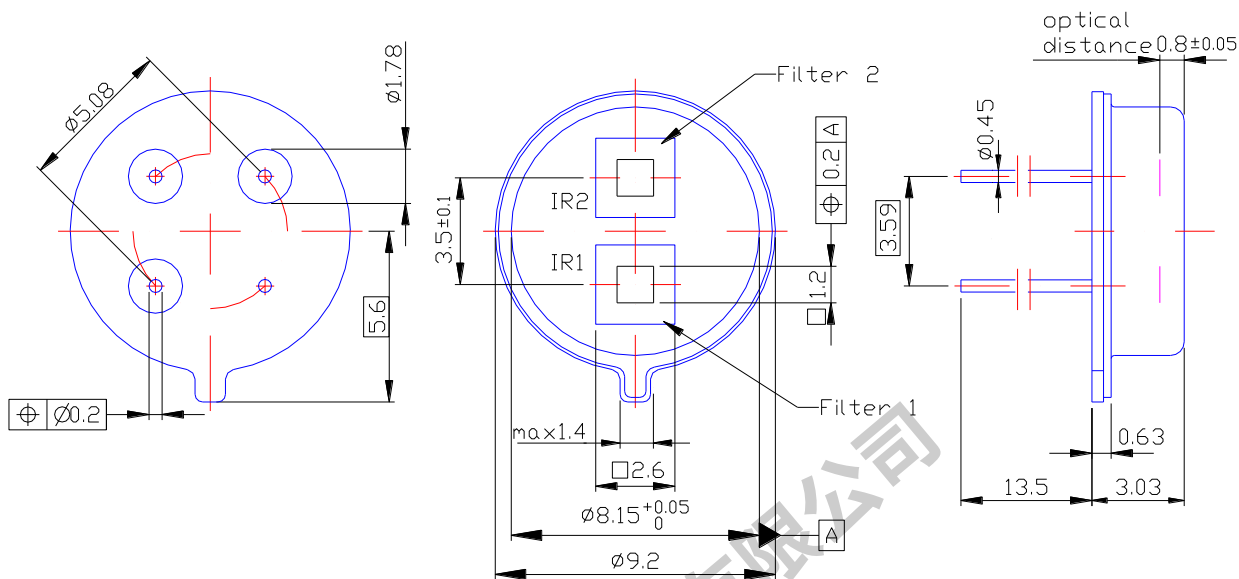
To read data from the chip, first the address and command must be sent. After the last ACK a new startbit (repeated start) and the address with a set read-flag initiates the read sequence. There can be as many bytes read as required. The last byte must be denoted by a non-acknowledge (nACK).

Filter Types

Filter Selection		
Filter Type	Application	Specification
F4.26-180	CO2 gas detection	NBP CWL 4.26 μ m HPB 180nm
F4.30-110	CO2 gas detection	NBP CWL 4.30 μ m HPB 110nm
F4.43-60	CO2 gas detection	NBP CWL 4.43 μ m HPB 60nm
F4.64-180	CO gas detection	NBP CWL 4.64 μ m HPB 180nm
F3.30-160	HC gas detection	NBP CWL 3.30 μ m HPB 160nm
F3.37-190	HC gas detection	NBP CWL 3.375 μ m HPB 190nm
F3.91-90	gas reference	NBP CWL 3.91 μ m HPB 90nm
F5.30-180	NOx gas detection	NBP CWL 5.30 μ m HPB 180nm

Please contact Heimann customer service for special filter requirements.

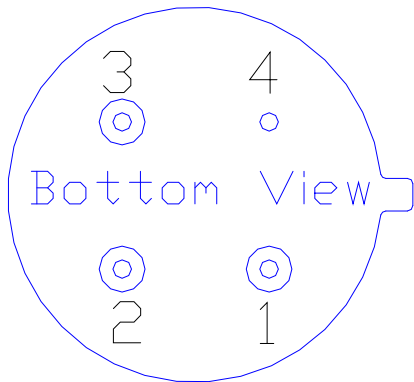
Dimensions



Pin Assignment

Pin No	Symbol	Description
1	SCL	Serial Clock (DIO, open drain, pull-up)
2	SDA	Serial Data (DIO, open drain, pull up)
3	VDD	Supply voltage
4	VSS	Ground (0V)

Bottom View



Top View

