Fraunhofer Institut
Mikroelektronische
Schaltungen und Systeme

Infrared Thermopile with Integrated Amplifier and Temperature Sensor IRTS1

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Features

The IRTS1 is a microsystem for the measurement of infrared radiation power density and the sensor temperature itself (fig. 1, 2, 3).

- **IR-sensor and temperature sensor**
- **CMOS compatible micro-system**

The sensor system, fabricated in CMOS compatible technology, consists of a thermopile with an IR-absorbing structure, a monolithically integrated amplifier for the thermopile voltage and a temperature sensor.

- **selectable IR-responsivity**
- **linear temperature sensor 20 mV/° C**
- **temperature range 0 ... 70 ° C**
- **low drift values**

The thermopile generates a voltage proportional to the received infrared radiation power. Signal amplification is done by an integrated amplifier with a selectable gain of 200 or 1000.

The integrated temperature sensor has a linear characteristic. It is helpful for contactless temperature measurements and for the temperature compensation of the IR-Sensor itself.

The chip area of this monolithically integrated microsystem is about 3,4 x 3,4 mm^2.

Applications

- Pyrometry
- Infrared Gas Analysis
- Intrusion Alarm Systems
- Contactless Temperature Measurement

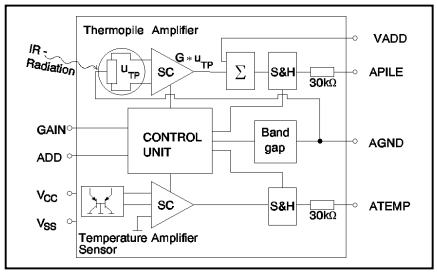

Fig. 1: Block diagram

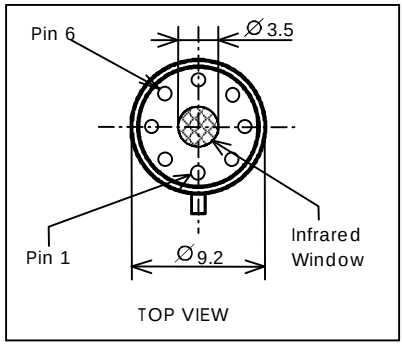

Fig. 2: Packaging (Top view)

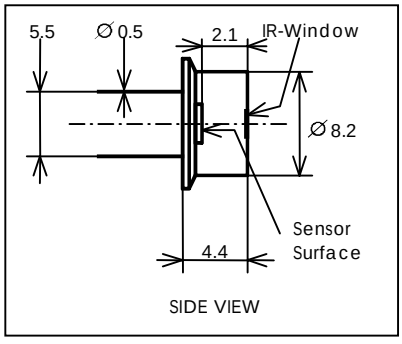

Fig. 2: Packaging (Side view)

Specifications

The specifications (fig. 4, 5, 6) on this information sheet are valid for:

- T = +25 ° C,
- V_{CC} = 5 V DC,
- load resistance = 1MΩ (Unless otherwise noted).

The information sheet is valid for both IRTS1_A and IRTS1_B. The values of IRTS1_B are represented in brackets.

Package

- TO-39, 8 Pin
- IR-Bandpass Filter: 6-15 µm
- Welded Metal Cap
- Fill Gas: Nitrogen

PIN Configuration

1 V_{SS} = 0 V

2 APILE

3 VADD

4 GAIN

5 AGND

6 ATEMP

7 ADD

8 V_{CC} = 5 V

«LOW» = V_{SS}
«HIGH» = V_{CC} or not connected

	MIN	TYP	MAX	UNITS
Temperature Range				
Storage	0		+ 70	° C
Operation	0		+ 70	° C
Power Supply				
Voltage V_{cc} - V_{ss}	4	5	6	V
Current		350		µA
Output APILE, ATEMP				
Voltage vs. AGND	-0,5		+1,7	V
Load Resistance	500			kΩ
Load Capacitance Stability		100		nF
Current		5		µA

Fig. 4: Global Parameters

$U_{APILE} = U_{Off} + R_V \times P_{IR}$ with ADD = «HIGH»
$U_{APILE} = U_{off} + R_V \times P_{IR} - 2 \times V_{ADD}$ with ADD = «LOW»

	GAIN ="LOW"	GAIN ="HIGH"	UNITS
Responsivity R_V			kV/W
1 Hz, 500 K Source	25 (37)	130 (180)	
Absorber Area	0,25 (0,16)	0,25 (0,16)	mm^2
Time Constant	22 (20)	22 (20)	ms
Output Noise Density, (rms) within 0,5 ... 200 Hz	100	400	µV/√Hz
Output Offset U_{Off}	-20 (-15)	-120 (-90)	mV
Output U_{APILE}			
Drift vs. Load Resistance R_L	2,0	2,5	%/MΩ
Drift vs. Supply Voltage	-5	-30	mV/V

Fig. 5: IR-Sensor parameters

$U_{ATEMP} = U (0 ° C) + TK_{TS} \times T$	TYP	UNITS
U (0 ° C)	-120	mV
Drift of U (0 ° C) vs. supply voltage within 4 V ≤ V_{cc} ≤ 6 V	6	mV/V
TK_{TS}	20	mV/° C
change of TK_{TS} vs. supply voltage within 4 V ≤ V_{cc} ≤ 6 V	0,2	mV/° C
Output Noise Density, (rms) within 0,5 ... 200 Hz	70	µV/√Hz

Fig. 6: Temperature Sensor parameters