POSiFA
Microsystems, Inc.

PTFD10

Thermal Flow Sensor Die

Description

Posifa's PTFD10 Thermal Flow Sensor Die measures the flow of a liquid or gaseous medium across the surface of the die using the Thermotransfer (Calorimetric) principle. It provides the sensing core for a wide range of air flow applications such as mass air flow sensors, air-mass meters for engine air-intake control, air velocity sensors, thermal differential pressure sensors. Additionally due to its innovative, robust micro-structure, PTFD10 is uniquely suited for liquid flow applications such as diesel fuel meters and disposable liquid micro-flow sensors for medical devices.

The sensor die is comprised of a central heater element (resistor), and two clusters of 20 thermocouples each positioned symmetrically up- and downstream of the heater. The upstream thermocouples are cooled by the flow and the downstream ones are heated due to heat transport from the heater in the flow direction. The output signal is the differential voltage of up- and downstream thermocouples.

PTFD10 offers two key advantages over traditional MEMS flow sensor design. First, thermocouples are used for temperature sensing instead of resistors, achieving ultra-low noise to signal, and enabling simplified circuitry. Second, an innovative "solid" thermal isolation base is used for the heater and the hot junctions of the thermocouples, eliminating fragile membrane or surface cavity. The "solid" nature of the thermal isolation base allows the sensor die to be coated with various ceramic films to protect it from abrasive wear as well as liquids and certain corrosive gases.

Posifa is committed to working closely with OEMs to develop innovative flow sensing applications to realize the full potential of the PTFD10 Thermal Flow Sensor Die.

Applications

- Mass flow, differential pressure, and air velocity monitoring in HVAC
- Air-mass meter (MAF) in engine air-intake control
- Medical respirators and ventilators
- Fuel consumption monitoring for diesel generators and engines
- Drug delivery and biomedical analytical tools

Features

- Suitable for liquid flow, gas flow and differential pressure applications
- Sensitive at extremely low flow rates and differential pressure levels
- Minimal zero drift
- Fast response
- Resistant to vibration and pressure shock
- Resistant to corrosive gases and liquids and other surface contamination (e.g. clogging caused by particles)
- Simple signal conditioning circuits

Absolute Maximum Ratings

- Operating Temperature: -40 °C to 125 °C
- Overpressure: 15 Bar (217 psi)
- Heating Current: 12 mA

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Performance Specifications

PARAMETER	MIN	TYP	MAX	UNIT
Heater Resistor	2,670	2,740	2,860	Ω
Reference Resistor	7,209	7,398	7,722	Ω
Resistor TCR (for both Heater and Reference)		3E-4		/ °C
Recommended Heating Current (Constant Current)		6.5		mA
Heater Excess Temperature @ 6.5 mA and 20 °C[1]		65		°C
Upstream Thermopile Output (in Air, 25°C)	100	120	135	mV
Downstream Thermopile Output (in Air, 25°C)	100	120	135	mV
Thermopile Resistance (25°C)	60	62	65	KΩ
Response Time			3	ms
Null Drift (Full Scale)		0.2		%/Year
Operating Temperature	-40		125	°C
Overpressure	15			bar
	217			psi

Note 1: This is the excess temperature over the ambient temperature of 20 °C

Die Dimensions

PARAMETERS	MIN	TYP	MAX	UNIT
Die Length	4.394		4.504	mm
Die Width	1.35		1.46	mm
Die Thickness	0.5		0.55	mm
Pad Size		80 x 120		µm

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Output Signals for Common Media

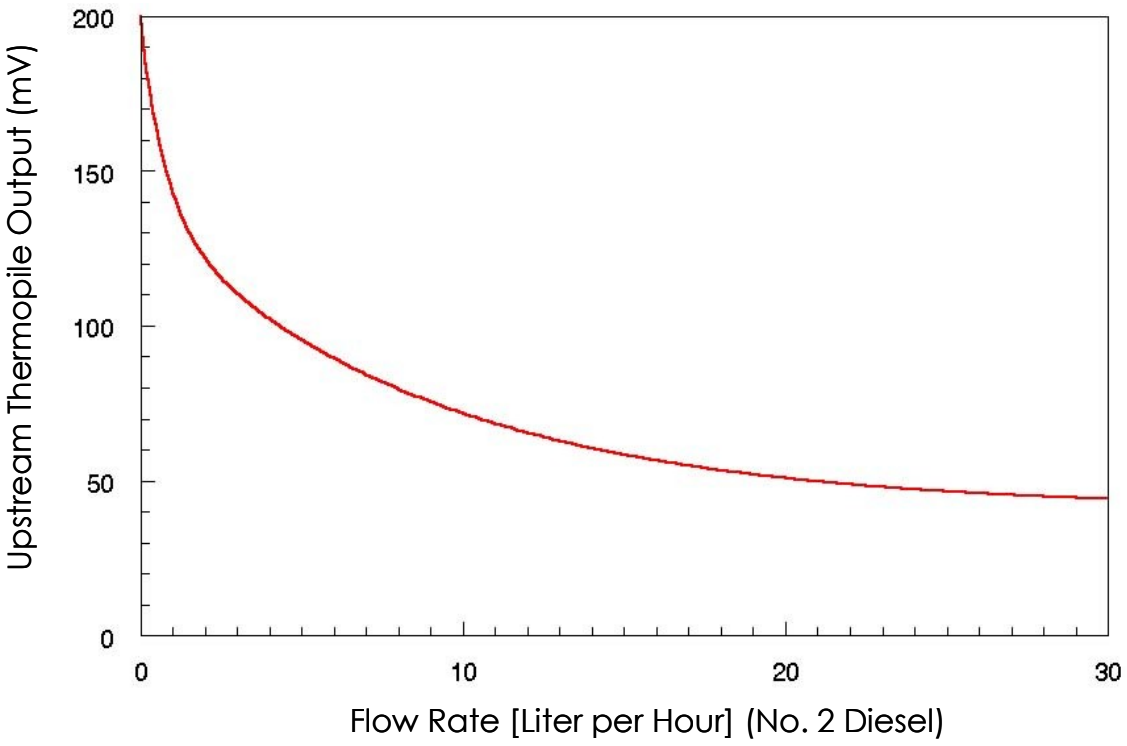
No. 2 Diesel Flow

Conditions:

5 mA constant current

20 °C

Tube used for testing: 1.5 x 9.5 mm rectangular cross section



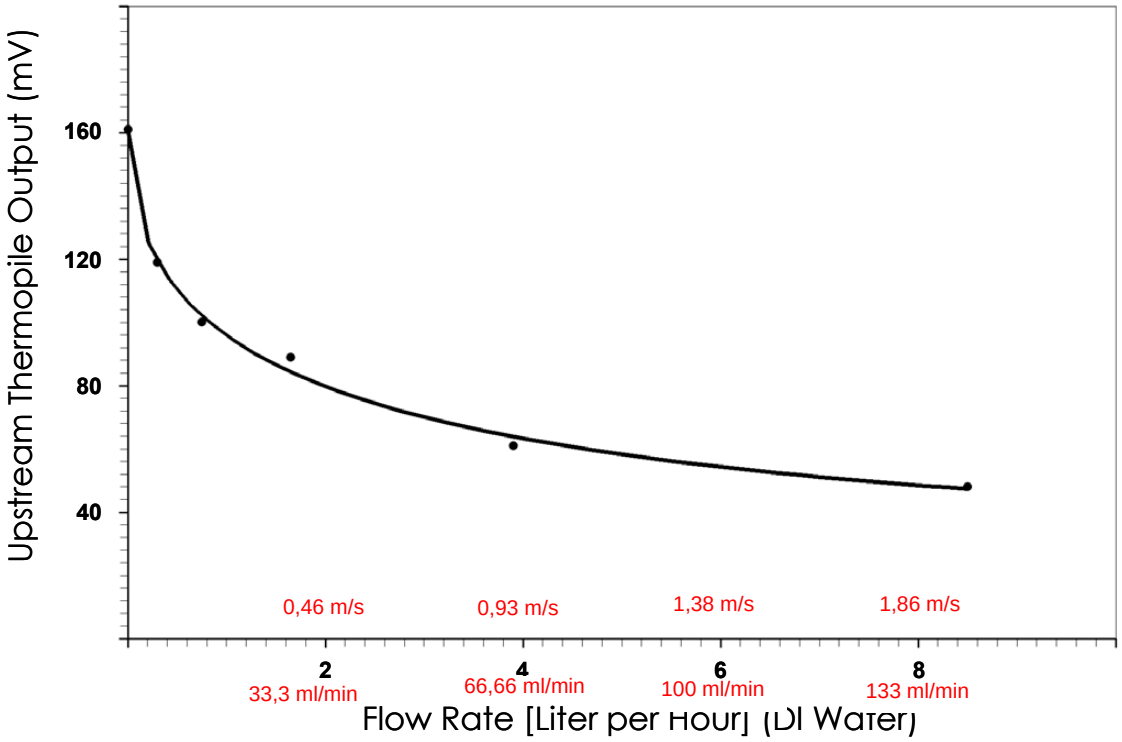
DI Water Flow

Conditions:

5 mA constant current

20 °C

Tube used for testing: 0.3 x 4.0 mm rectangular cross section



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POSiFA

PTFD10

Output Signals for Common Media

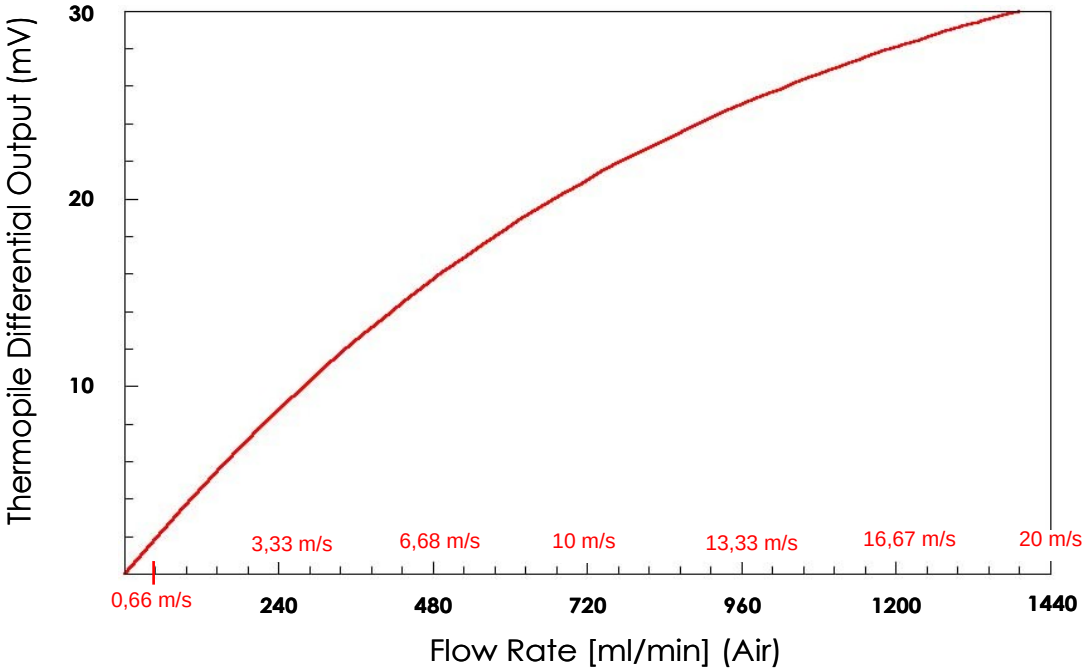
Air Flow

Conditions:

5 mA constant current

20 °C

Tube used for testing: 0.3 x 4.0 mm rectangular cross section



Differential Air Pressure

0-300 Pa (1.2 in H_2O)

Conditions:

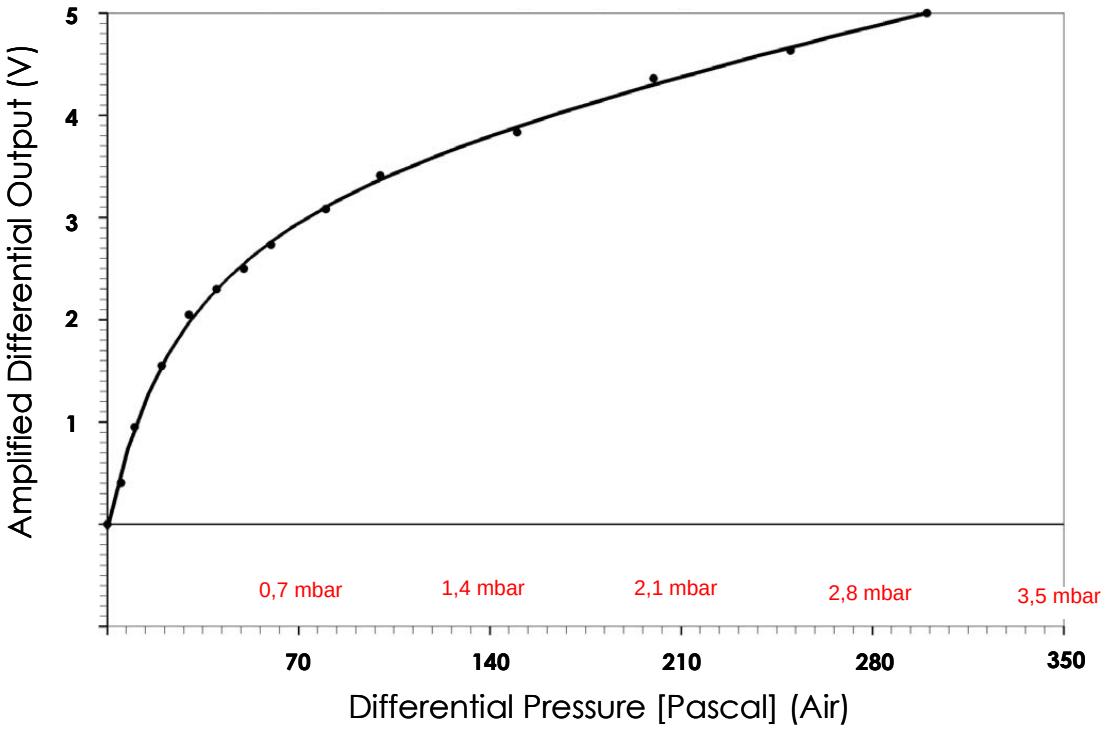
Using a reference signal conditioning circuit

Supply: 24VDC

25 °C, 1 atm

Vout: 0-5VDC

Tube used for testing: 0.3 x 4.0 mm rectangular cross section



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Connections

[1,5] Downstream Thermopile

[2,6] Heater Resistor

[3,7] Upstream Thermopile

[4,8] Reference Resistor

Ordering Information

Part Number	Specifications
PTFD10-NG	Bare die; For non-aggressive gases
PTFD10-LQ	Bare die; For liquids