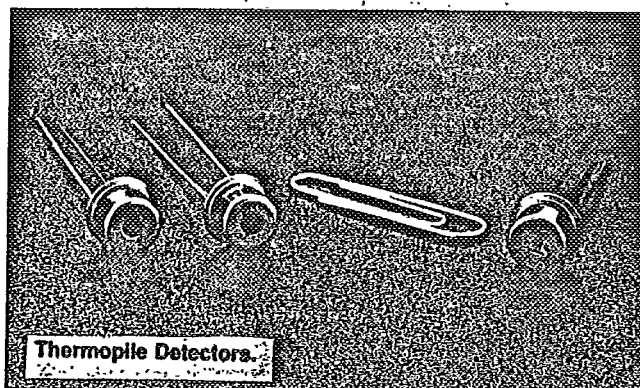


ORIEL THERMOPILE DETECTORS

For Radiation Measurements From the UV to FAR IR



- Broad spectral response: 0.2 to 50 microns
- Rugged thin film construction for high reliability
- Excellent long term stability
- Interchangeable windows
- Room temperature operation
- Self-generating voltage - no bias required
- Noise behavior ideal for DC or low frequency operation
- Complete detector housing available

OPERATION

The classic thermopile is an array of junctions of dissimilar metals connected in series. Alternate (hot) junctions are blackened and/or attached to plates to increase their effective area; the remainder are cold junctions maintained at ambient temperature. Radiation absorbed by the hot junctions increases their temperature relative to the cold junctions and an emf is produced. Since the conversion process is strictly thermal, only the absorption characteristics of the blackening material affects the wavelength response.

In the past, thermopiles were hand made from very fine unsupported wires. Rugged models were insensitive and slow, while the sensitive models were delicate and expensive. Oriel Thermopiles use thin film technology to produce the junctions. More junctions can be packed into the active area, and the devices are rugged and reliable. The proprietary black coating is spectrally neutral from the UV through the IR. These thermopiles operate at room temperature, and can be used for measuring steady or slowly varying signals.

CHOOSING THE PROPER DETECTOR

Detector Size

- The 2 x 2 mm detectors are for most general purpose applications.
- The 0.8 x 2 mm detectors are for imaging an elongated source such as a monochromator slit.
- The 6 mm diameter detectors have a uniform response over the central 5 mm diameter. This is particularly useful for measuring the total power of a laser or focused beam.

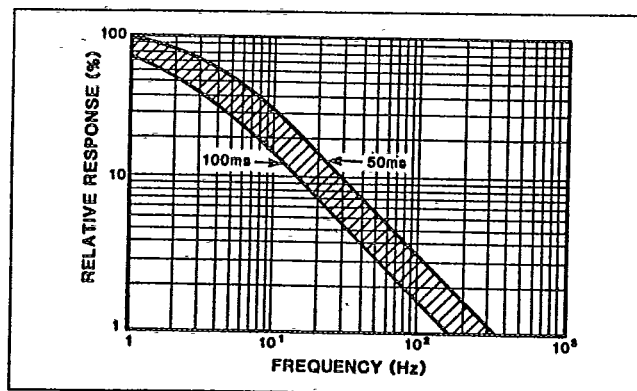


Fig. 1 Typical Responsivity of Thermopile Detectors with fast response coating.

SPECIFICATIONS/ORDERING INFORMATION

Interchangeable Windows

10 mm diameter by 1 mm thick for use in the Detector Mounts or Housings. (See page 328.)

3810 Fused Silica Window	\$ 46.00
3811 Calcium Fluoride Window	\$ 92.00
3812 Potassium Bromide Window	\$ 46.00

3813 KRS-5 Window	\$ 129.00
3814 Intran 2 Window	\$ 102.00
3815 Silicon Window	\$ 87.00

Detectors

Detector Area (mm x mm)	Surface Type	Window	Number of hot Junctions	Maximum Irradiance (W cm ⁻²)	DC Responsivity (V/W)	D* (cm Hz ^{1/2} W ⁻¹)	NEP (W Hz ^{-1/2})
2 x 2	Black	None	48	0.1	9-16	2 x 10 ⁸	10 ⁻⁹
2 x 2	Fast	KBr	48	0.1	9-16	2 x 10 ⁸	10 ⁻⁹
2 x 2	Fast	KRS-5	48	0.1	9-16	2 x 10 ⁸	10 ⁻⁹
0.8 x 2.4	Black*	Black ¹	20	0.1	6-10	1.7 x 10 ⁸	10 ⁻⁹
6 mm diameter	Black*	Black ¹	75	0.1	3-5	1 x 10 ⁸	5 x 10 ⁻⁹

¹For faster response in these sizes contact Oriel Applications Engineers.



Detector Black Coating

Two types of black coatings can be applied to the active element:

- The **Stable Black Coating** is an organic paint which is absorptive from 0.2 to beyond 50 μm , but with slightly reduced absorptivity from 1 to 15 μm . (Fig 2.) Thermopiles with this coating can be used without windows or with interchangeable windows to reduce the effects of air currents. Our housings have holders for our 10 mm diameter 1 mm thick windows. The window transmission may influence the spectral response.
- The **Metal Oxide Coating** also has a uniform and broadband response. A thermopile with this thin coating has a response time which is 2 to 3 times faster than a similar thermopile with the paint coating. Since the metal oxide is attacked by the atmosphere, detectors with this coating have permanently sealed windows.

See page 445 for window transmittance.

TO READ OUT THESE DETECTORS

The output signal is a self-generated voltage.

For D.C. operation, use a microvoltmeter. You can estimate the sensitivity required of the microvoltmeter from the power incident on the thermopile and the tabulated responsivity. The readings will drift if the temperature of the detector casing and cold junction change. You should shutter the beam to prevent it from warming the detector. Only open the shutter to read the signal level.

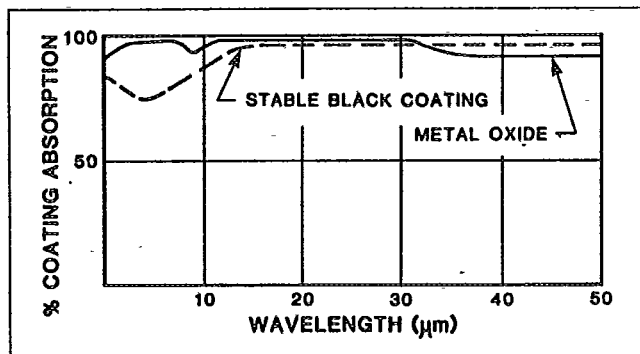


Fig. 2 Absorptivity of our Thermopile coatings.

WINDOW CHARACTERISTICS (1 mm thick)

Material	Usable Spectral Range (μm)	Approx. Transmittance In Range (%)	Water Solubility (g/100 g)	Affected by Humidity
IR Fused Silica	0.20-3.5	93	0	No
Calcium Fluoride (CaF_2)	0.13-11	94	0.0017	No
Potassium Bromide (KBr)	0.25-26	93	53.5	Yes
KRS-5	0.60-40	74	0.05	No
Irtran 2 (ZnS)	2.00-13	73	0	No

See page 445 for transmittance curves for these materials.

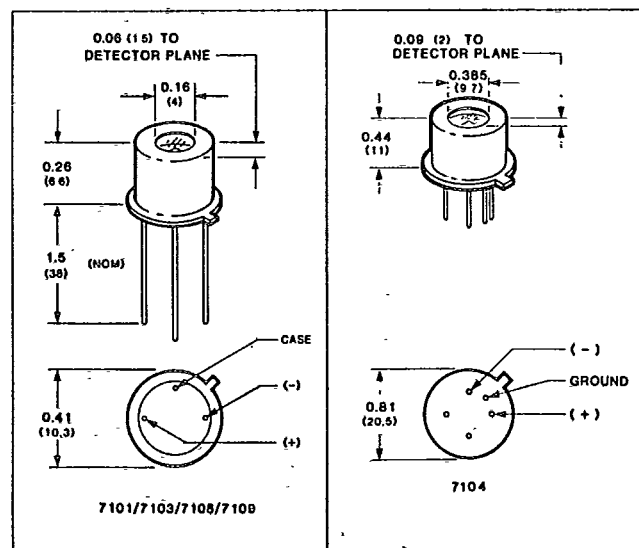


Fig. 3 Thermopile Detectors. See page 328 for Thermopile Detector Housings.

Resistance (k Ω)	Time Constant (ms)	Case Type	Detector Only		Detector in Housing	
			Model No.	Price (\$)	Model No.	Price (\$)
6-15	100-250	TO-5	7101	\$ 293.00	71775**	\$ 651.00
6-15	50-100	TO-5	7108	\$ 293.00	71776**	\$ 651.00
6-15	50-100	TO-5	7109	\$ 324.00	71777**	\$ 682.00
1-5	300	TO-5	7103	\$ 293.00	71778**	\$ 671.00
18-35	800-1400	TO-8	7104	\$ 324.00	71779***	\$ 682.00