

Thermopile detectors



T11722 series

High sensitivity thermopile detectors with built-in thermistor for CO₂ · CH₄ concentration measurement

The T11722 series is a dual type thermopile detector developed for high accuracy measurement of gas concentration. These consist of two highly sensitive Si thermopile detectors and two band-pass filters. These products come with built-in thermistor, so they can correct sensitivity changes caused by changes in ambient temperature. The T11722-11 can simultaneously detect two wavelengths of 4.26 μm (for CO₂) and 3.9 μm (for reference), and the T11722-12 can simultaneously detect two wavelengths of 3.3 μm (for CH₄) and 3.9 μm (for reference).

Features

- Two wavelengths detection
- High sensitivity
- Metal package

Applications

- CO₂ concentration measurement
- CH₄ concentration measurement

Structure

Parameter	Specification	Unit
Number of elements	2	-
Photosensitive area (per element)	1.2 × 1.2	mm
Package	TO-5	-

Absolute maximum ratings (Ta=25 °C)

Parameter	Symbol	Condition	Value	Unit
Operating temperature	T _{opr}	No dew condensation*1	-30 to +85	°C
Storage temperature	T _{stg}	No dew condensation*1	-40 to +125	°C
Thermistor power dissipation	P _{d_th}		0.2	mW

*1: When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.

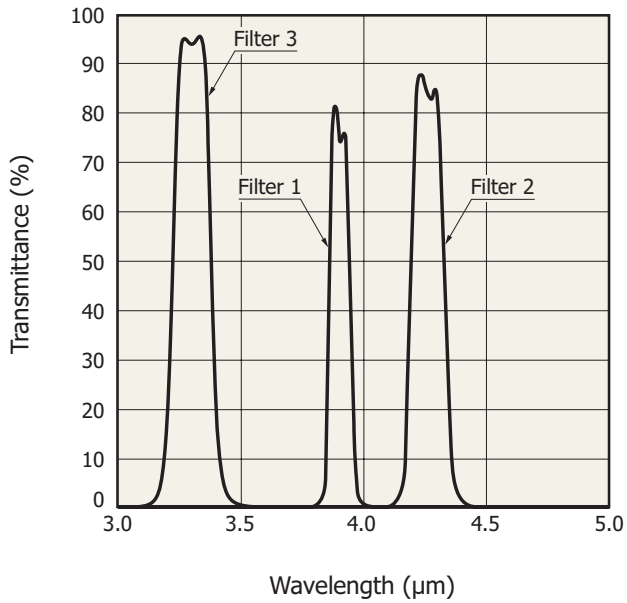
Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

Electrical and optical characteristics (Ta=25 °C)

Parameter	Symbol	Condition	T11722-11			T11722-12			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral response range	λ	Band-pass filter center wavelength (FWHM)	-	For reference: 3.9 (0.09) For CO ₂ : 4.26 (0.14)	-	-	For reference: 3.9 (0.09) For CH ₄ : 3.3 (0.16)	-	μm
Photosensitivity*2	S	f=1Hz Black body=500 K	40	50	60	40	50	60	V/W
Element resistance	R _e		100	125	150	100	125	150	kΩ
Temperature coefficient of Re	ΔTRe		-	0.03	-	-	0.03	-	%/°C
Noise voltage	V _n	Johnson noise	-	45	50	-	45	50	nV/Hz ^{1/2}
Noise equivalent power*2	NEP		-	0.9 × 10 ⁻⁹	1.3 × 10 ⁻⁹	-	0.9 × 10 ⁻⁹	1.3 × 10 ⁻⁹	W/Hz ^{1/2}
Detectivity*2	D*		0.9 × 10 ⁸	1.3 × 10 ⁸	-	0.9 × 10 ⁸	1.3 × 10 ⁸	-	cm ² ·Hz ^{1/2} /W
Rise time	t _r	0 to 63%	-	20	30	-	20	30	ms
Thermistor resistance	R _{th}		9	10	11	9	10	11	kΩ
Thermistor B constant	B	25/75 °C	3800	3900	4000	3800	3900	4000	K

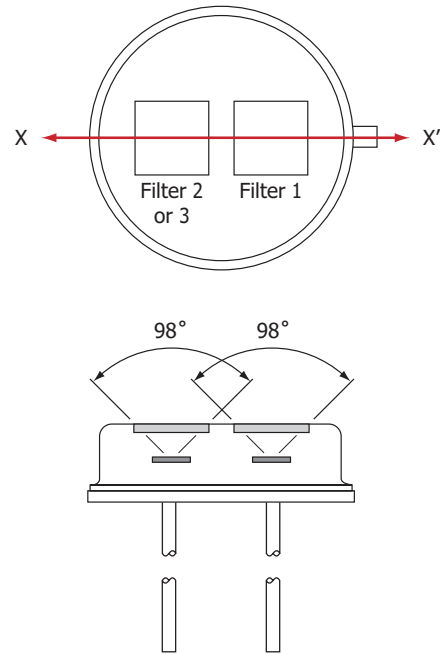
*2: Without filter

Spectral transmittance characteristics of window materials (typical example)



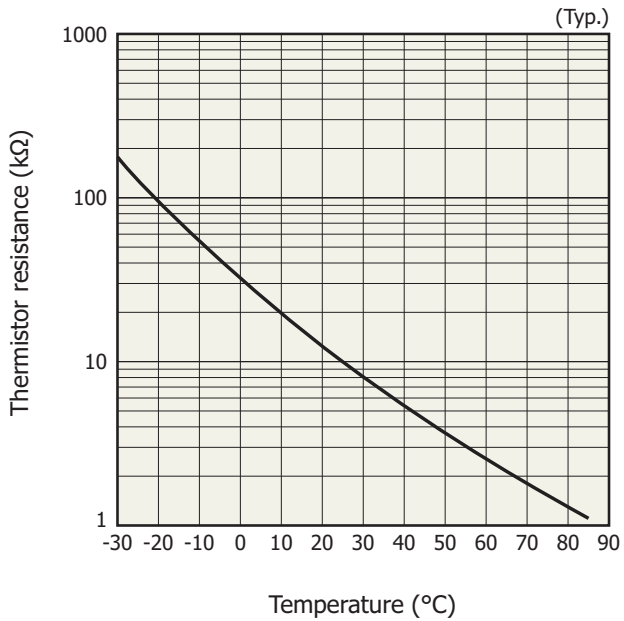
KIRDB0711EA

Field of view



KIRDC0142EA

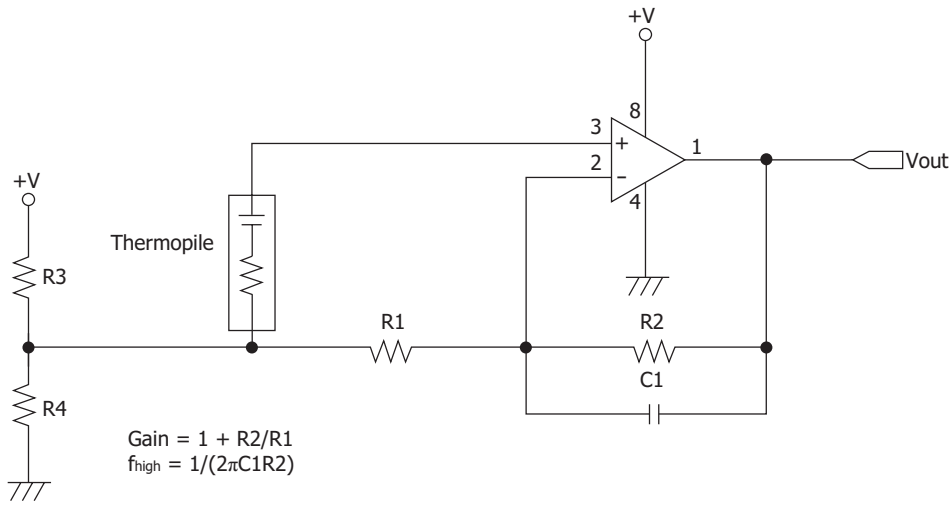
Thermistor temperature characteristics



KIRDB0712EB

Operating circuits

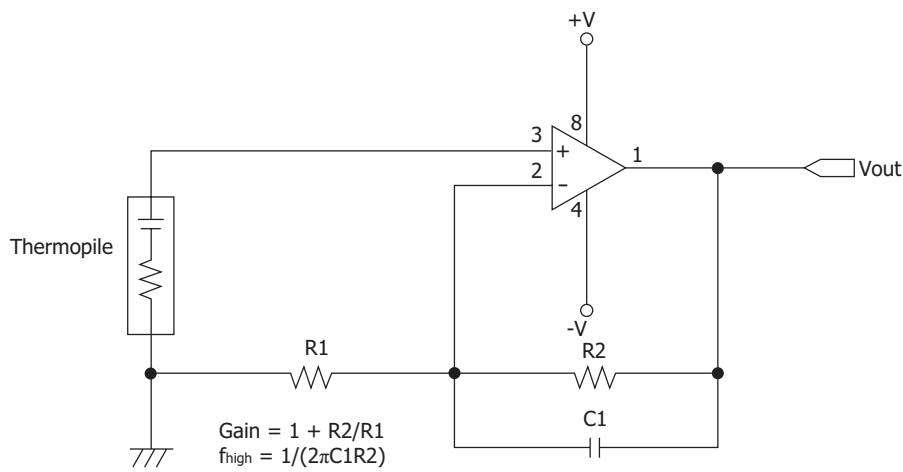
Single power supply type



Since the thermopile output signal is very low in the order of microvolts, use an amplifier with a low offset voltage. (e.g., LTC1050)

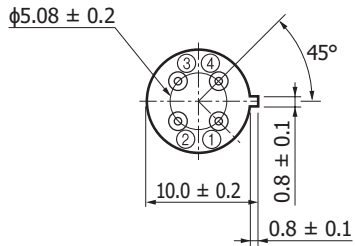
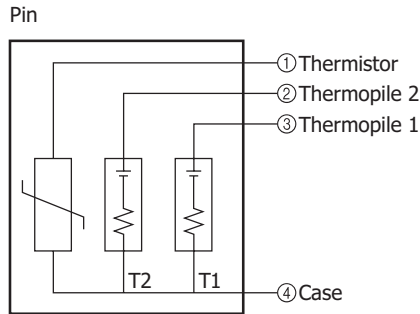
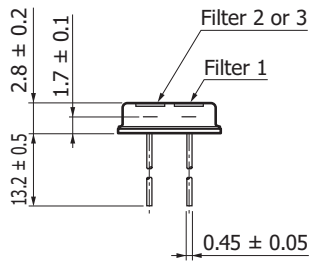
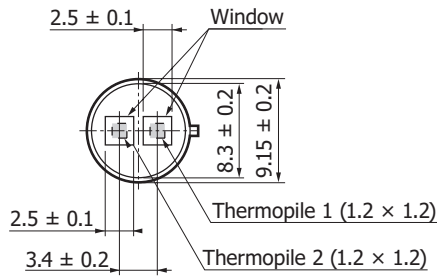
KIRDC0104EA

Dual power supply type



KIRDC0105EA

Dimensional outline (unit: mm)



		T11722-11	T11722-12
Thermopile 1	Filter 1	3.9 μm (for reference)	3.9 μm (for reference)
Thermopile 2	Filter 2	4.26 μm (for CO ₂)	-
	Filter 3	-	3.3 μm (for CH ₄)

KIRDA0279EC

Recommended soldering conditions

- Solder temperature: 260 °C (10 s or less, once)
Solder the leads at a point at least 1 mm away from the package body.

Note: When you set soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

Precautions

The band-pass filters used in this product have a secondary transmission at wavelengths longer than 10 μm. If the secondary transmission affects measurements, install a sapphire glass, etc. in front of the light input window to block long wavelength light.

When the temperature of the thermopile detector changes rapidly, output changes greatly. Be careful during design so that element temperature does not change suddenly. We recommend you take the following steps to measure incident light level with high accuracy.

- Do not place an IC that has large current consumption near this product.
- Do not use a structure that makes this product directly contact the heating element.
- If necessary, enclose the product with a material that has high heat capacity, so that element temperature changes gradually.

Excessive light entering the thermopile can damage the photosensitive area. Depending on the operating conditions, injection of φ500 μm and 40 mW (approximately 200 mW/mm²) of light into the photosensitive area may cause failure or degradation of characteristics.

Related information

www.hamamatsu.com/sp/ssd/doc_en.html

■ Precautions

- Disclaimer
- Metal, ceramic, plastic package products

■ Technical information

- Thermopile detectors / Technical note

Information described in this material is current as of May 2022.

Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

HAMAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184

U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218 E-mail: usa@hamamatsu.com

Germany: HAMAMATSU PHOTONICS DEUTSCHLAND GMBH.: Arzbergerstr. 10, 82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8 E-mail: info@hamamatsu.de

France: HAMAMATSU PHOTONICS FRANCE S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: infos@hamamatsu.fr

United Kingdom: HAMAMATSU PHOTONICS UK LIMITED: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: info@hamamatsu.co.uk

North Europe: HAMAMATSU PHOTONICS NORDEN AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46)8-509 031 00, Fax: (46)8-509 031 01 E-mail: info@hamamatsu.se

Italy: HAMAMATSU PHOTONICS ITALIA S.R.L.: Strada della Moia, 1 int. 6, 20044 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41 E-mail: info@hamamatsu.it

China: HAMAMATSU PHOTONICS (CHINA) CO., LTD.: 1201 Tower B, Jianning Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R. China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn

Taiwan: HAMAMATSU PHOTONICS TAIWAN CO., LTD.: 8F-3, No.158, Section 2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.tw