AK9710AEF3A
IR Sensor for NDIR Gas Sensing

1. General Description

The AK9710AEF3A is a small mid-infrared quantum photo diode made of InSb. It can work at room temperature by AKM unique compound semiconductor technology, which realizes the high sensitivity, high speed response, and high reliability. The AK9710AEF3A has a built in an optical band pass filter capable of detecting a wavelength of 3.9μm. This sensor is optimized to NDIR Gas Sensing application.

2. Features

- ☐ High Sensitivity
  Signal-to-noise ratio is three times higher than conventional thermopiles.
- ☐ High Speed Response (~100kHz)
- ☐ High Reliability
- ☐ No bias voltage needed
- ☐ Built in an Optical Band Pass Filter for Gas Sensing
  Center wave length: 3.9μm
- ☐ 3mm x 3mm small surface mount type plastic package
- ☐ Application
  For reference of various gas sensor
  (CO_2, CH_4, CO etc.)

3. Table of Contents

4. Block Diagram and Functions

4.1. Block Diagram

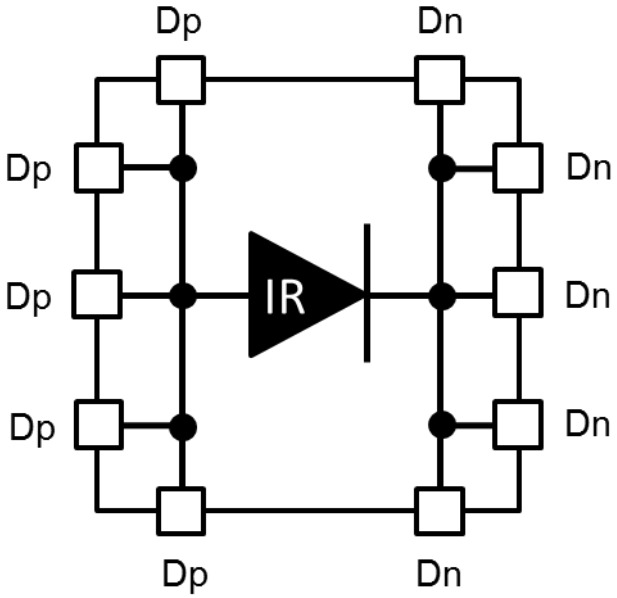


Figure 4.1 Block Diagram

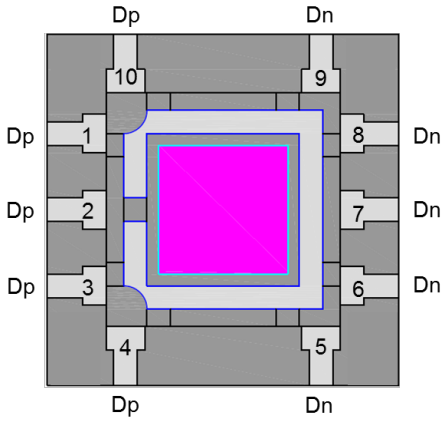
4.2. Functions

Table 4.1 Block Functions

Block	Function
IR	Mid-infrared quantum photo diode

5. Pin Configurations and Functions

5.1. Pin Configurations



Top View

Figure 5.1 Pin Configurations

5.2. Functions

Table 5.1 Pin Functions

Pin No.	Name	I/O	Functions
1, 2, 3, 4, 10	Dp	—	p-type output pin
5, 6, 7, 8, 9	Dn	—	n-type output pin

6. Absolute Maximum Ratings

Table 6.1 Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Operating Temperature	Ta	-40	85	°C
Storage Temperature	Tstg	-40	85	°C

Notes

Operation exceeding these ratings may cause permanent damage to device.
Do not apply a bias voltage.

7. Recommended Operating Conditions

Table 7.1 Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input Voltage (*1)	Vin	-10	0	10	μV
Operating Temperature	Ta	-40		85	°C

Notes

*1: Do not apply a bias voltage between Dp and Dn.
Refer to the recommended external circuits.

8. Electrical Characteristics

Table 8.1 Electrical Characteristics

Unless otherwise specified, Ta = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit
Output Current (*2)	Ip	0.58	1.16	2.04	nA
Internal Resistance (*3)	Ro	75		188	kΩ

Notes:

*2: Measurement conditions:
The final test is done by the equivalent light source as below.
- Light source
  Blackbody furnace with diameter = 22.2mm
  Surface temperature = 500°C
- Distance
  AK9710AEF3A to blackbody = 10cm.
- The soda glass is placed between the sensor and the blackbody furnace.
- Measured by a 10Hz lock-in amplifier.

*3: Measurement conditions:
- Average value at ±500nA output.

9. Optical Filter Specification

Table 9.1 Optical Filter Specification

Angle of incidence = 0°
Ta = 25°C

Parameter	Symbol	Min	Typ	Max	Unit
Center wavelength	CWL	3830	3910	3990	nm
Full width at half maximum	FWHM	81	90	99	nm

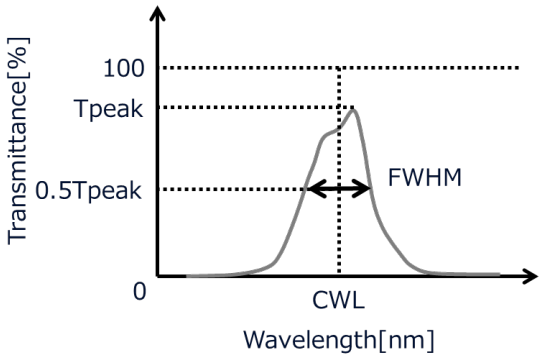


Figure 9.1 Definition of CWL, FWHM and Tpeak

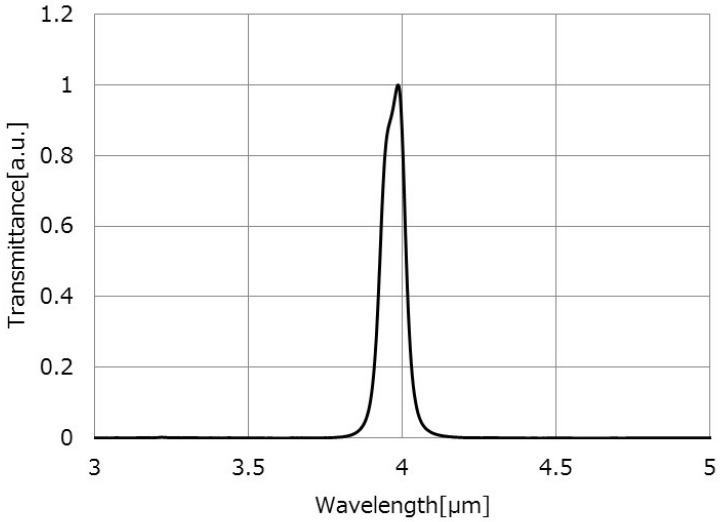


Figure 9.2 Optical filter transmittance (Reference)

10. Recommended External Circuits

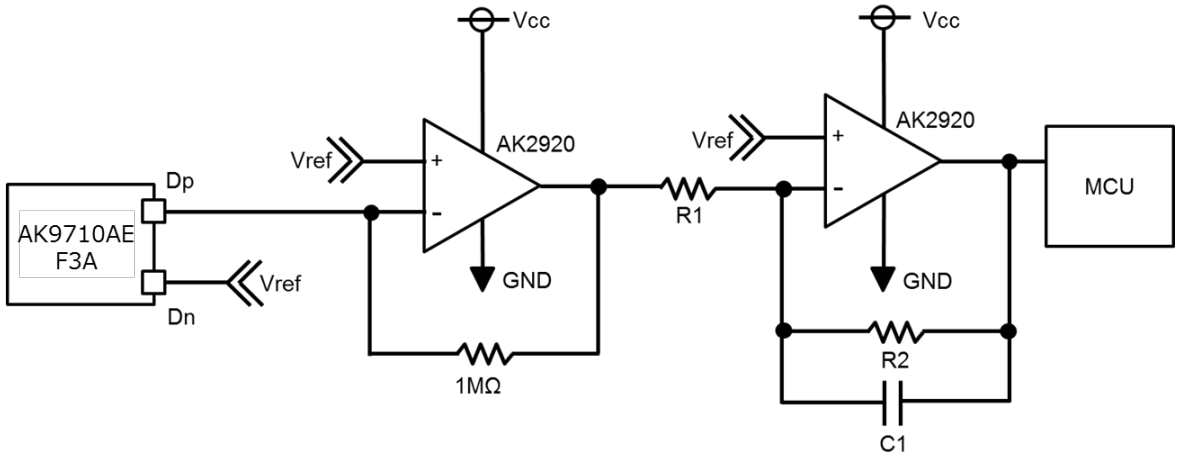


Figure 10.1 Recommended external circuits

*Vref level is between Vcc level and GND level.
*R1, R2, and C1 should be optimized for the application.

11. Package

11.1. Outline Dimensions

Unit: mm

Unless otherwise specified: ± 0.1mm

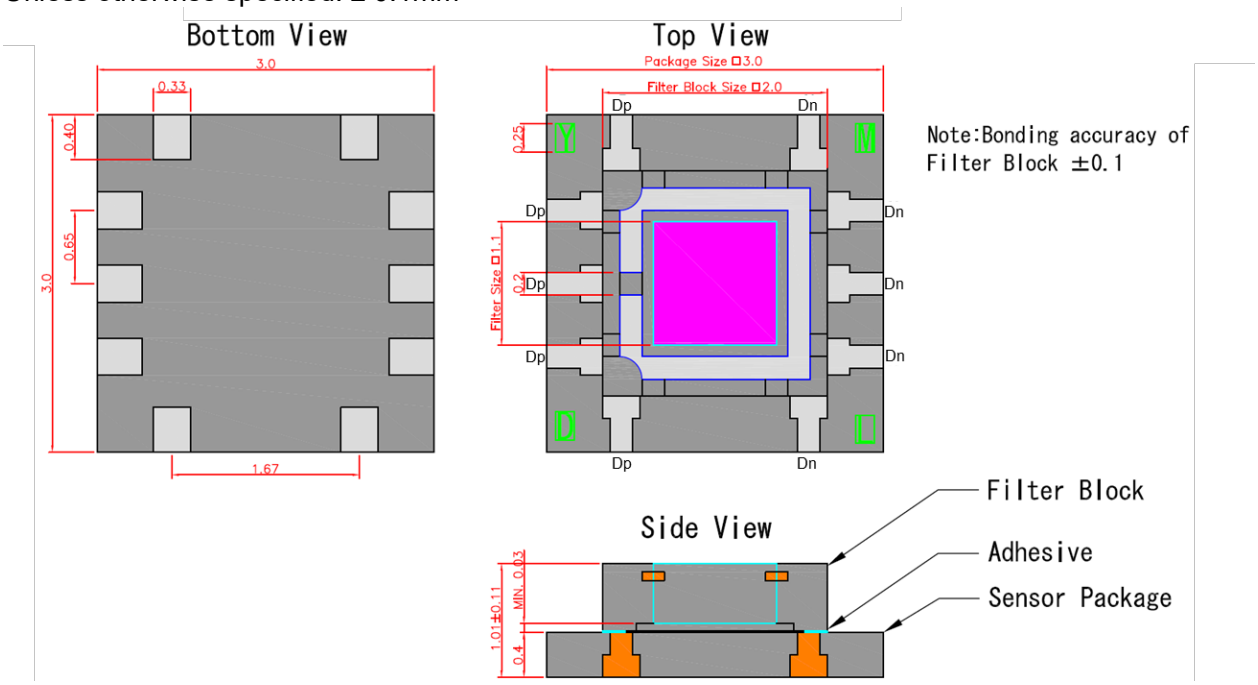


Figure 11.1 Outline Dimensions

11.2. Pad Dimensions

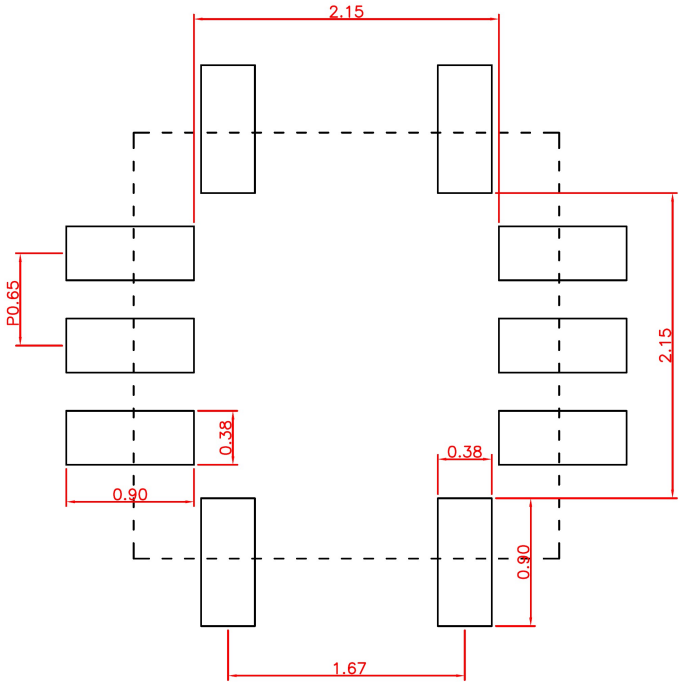
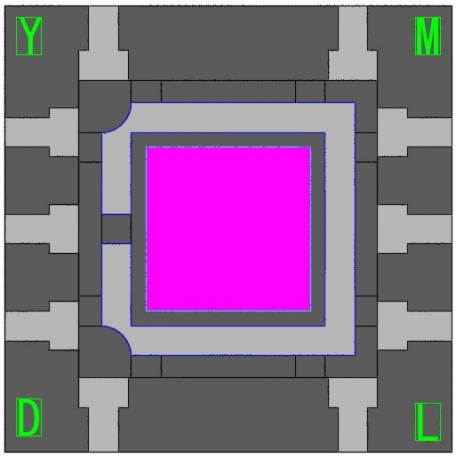


Figure 11.2 Pad Dimensions

11.3. Marking



Y (Year)		M (Month)		D (Day)		L (Lot)	
Mark	Year	Mark	Month	Mark	Day	Mark	Lot
0	2020	C	Jan.	1	1	1	1
1	2021	D	Feb.	2	2	2	2
2	2022	E	Mar.	3	3	3	3
3	2023	F	Apr.	4	4	4	4
4	2024	G	May.	5	5	5	5
5	2015	H	Jun.	6	6	6	6
6	2016	J	Jul.	7	7	7	7
7	2017	K	Aug.	8	8	8	8
8	2018	L	Sep.	9	9	9	9
9	2019	M	Oct.	0	10	0	10
		N	Nov.	A	11	A	11
		P	Dec.	B	12	B	12
				C	13	C	13
				D	14	D	14
				E	15	E	15
				F	16	F	16
				G	17	G	17
				H	18	H	18
				J	19	J	19
				K	20	K	20
				L	21	L	21
				N	22	M	22
				P	23	N	23
				R	24	P	24
				S	25	R	25
				T	26	S	26
				U	27	T	27
				V	28	U	28
				W	29	V	29
				X	30	W	30
				Y	31	X	31
						Y	32
						Z	33

12. Precautions

<Electrostatic Discharge (ESD)>

This product is sensitive to Electrostatic Discharge (ESD). When handling the product, please be careful about the following matters.

- •When you handle the product, please work in the environment to protect against static electricity (ex. more than 40%RH).
- •Always use an ESD wrist strap and wear antistatic clothes.
- •Please take electrostatic measures of the container etc. where the product touches directly.

<Storage Environment>

Please avoid exposed to direct sunlight. Please keep it as much as possible at room temperature and normal humidity. The desirable condition is 5-35 °C and 40 - 85%RH. In addition, please keep the product away from the chlorine gas and the causticity gas. When this product is kept in inappropriate environment, it may influence product properties.

<Other Precautions>

As Gallium Arsenide (GaAs) and Indium Antimonide (InSb) are used for this product, please be careful about the following matters.

1) Please do not take this product to burning and melting and destroys, chemical processing etc..
2) When you discard this product, please handle it according to related laws and your regulations on waste disposal.

Please be careful not to damage and pollute the sensor surface because the sensor properties may change.

13. Ordering Guide

AK9710AEF3A	-40 ~ 85ºC	10-pin SON	Consumer Grade

14. Revision History

Date (Y/M/D)	Revision	Reason	Page	Contents
17/9/25	00	First Edition		

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