

PDIC for CD-ROM/DVD-ROM

Description

CXA2586M is a PDIC (photodetector IC) developed as a photodetector for the optical pickup of CD-ROM/DVD-ROM.

The photodiode and circuit blocks operate at high speed. (Typ. 100MHz)

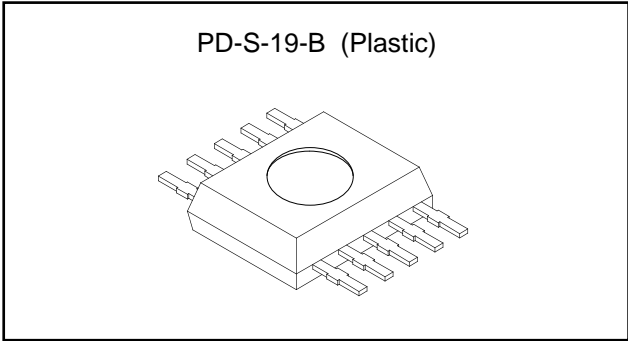
- Focus servo : astigmatic method
- Tracking servo (CD)
 - : three-spot method
- Tracking servo (DVD)
 - : differential phase detection method

Features

- High-speed I-V amplifier (current-voltage conversion circuit)
- High-speed photodiode
- Adding amplifier (addition of A to D)
- Compact transparent molded package (SOP)

Applications

Optical pickup for CD-ROM/DVD-ROM



Absolute Maximum Ratings (Ta=25 °C)

| | | | |
|-------------------------------|------|-------------|----|
| • Supply voltage | Vcc | 5.5 | V |
| • Operating temperature | Topr | -10 to +70 | °C |
| • Storage temperature | Tstg | -40 to +100 | °C |
| • Allowable power dissipation | Pd | 300 | mW |

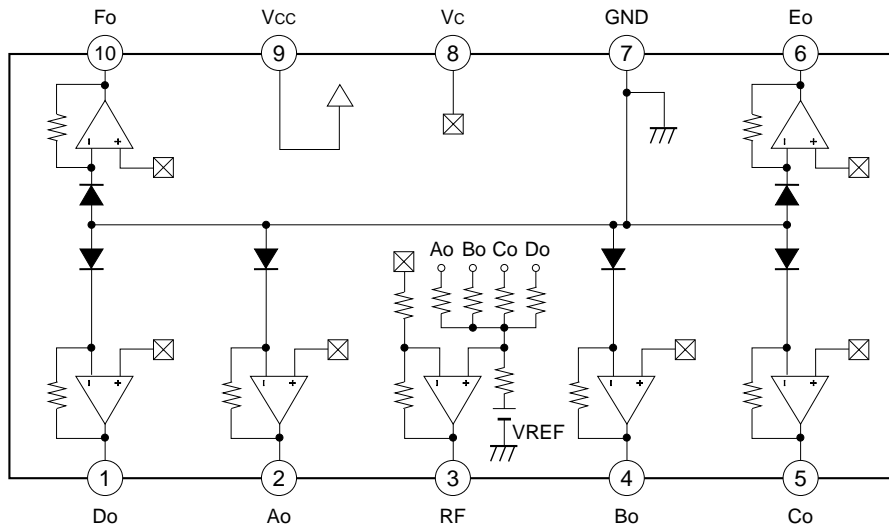
Operating Conditions

| | | | |
|-------------------|-----|----------------|---|
| • Supply voltage1 | Vcc | 4.5 to 5.5 | V |
| • Supply voltage2 | Vc | 1.5 to Vcc-1.5 | V |

Structure

Bipolar silicon monolithic IC

Block Diagram and Pin Configuration



* The components marked by A, B, C, D, E and F are the photodiodes (photo sensitivity. About 0.4A/W @650nm, 780nm)

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Pin Description

| Pin No. | Symbol | I/O | Equivalent circuit | Description |
|------------------|----------------------|-----|--------------------|--|
| 2 4 1 5 | Ao Bo Co Do | O | | Output of voltage signals converted from optical signals |
| 6 10 | Eo Fo | O | | Output of voltage signals converted from optical signals |
| 3 | RF | O | | Output of addition of Ao to Do |
| 7 | GND | I | | For dual power supply : negative power supply For a single power supply : GND |
| 8 | Vc | I | | For dual power supply : GND For a single power supply : center voltage input |
| 9 | Vcc | I | | Positive power supply |

Electrical and Optical Characteristics

(V_{CC}=5.0 V, V_C=2.5 V, T_a=25 °C)

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------------|-------------------|---|------|------|------|------|
| Current consumption | I _{CC} | In the dark | — | 15 | 20 | mA |
| Output offset voltage (A to D) | V _{off} | In the dark, V _C reference | -25 | 0 | 25 | mV |
| Output offset voltage (E, F) | V _{off} | In the dark, V _C reference | -15 | 0 | 15 | mV |
| Output offset voltage (RF) | V _{off} | In the dark, GND reference | 1.25 | 1.4 | 1.55 | V |
| Output voltage difference | ΔV _{off} | A-B, in the dark | -20 | 0 | 20 | mV |
| | | C-D, in the dark | -20 | 0 | 20 | mV |
| | | (A+C) - (B+D), in the dark | -20 | 0 | 20 | mV |
| | | E-F, in the dark | -15 | 0 | 15 | mV |
| Sum of output offset voltages | V _{offs} | A+B+C+D, in the dark | -100 | 0 | 100 | mV |
| Output voltage (A to D) | V _o | λ=650 nm, 780 nm, P _o =10 μW | 180 | 246 | 312 | mV |
| Output voltage (E, F) | V _o | λ=650 nm, 780 nm, P _o =10 μW | 312 | 447 | 581 | mV |
| Output voltage (RF) | V _o | λ=650 nm, 780 nm, P _o =10 μW | 302 | 432 | 561 | mV |
| Output voltage ratio (E, F/A to D) | V _{OR} | λ=650 nm, 780 nm, P _o =10 μW | 1.71 | 1.81 | 1.90 | — |
| Output voltage ratio (RF/A to D) | V _{OR} | λ=650 nm, 780 nm, P _o =10 μW | 1.67 | 1.76 | 1.84 | — |
| Maximum output voltage (A to D) | V _o | λ=650 nm, 780 nm, P _o =100 μW | 3.8 | 4.0 | — | V |
| Maximum output voltage (E, F) | V _o | λ=650 nm, 780 nm, P _o =100 μW | 3.8 | 4.0 | — | V |
| Maximum output voltage (RF) | V _o | λ=650 nm, 780 nm, P _o =100 μW | 3.8 | 4.0 | — | V |
| Frequency response (A to D) | f _c | λ=650 nm, 780 nm P _o =10 μW _{DC} , 4 μW _{p-p} 100 kHz reference, -3 dB | 70 | 100 | — | MHz |
| Frequency response (E, F) | f _c | λ=650 nm, 780 nm P _o =10 μW _{DC} , 4 μW _{p-p} 100 kHz reference, -3 dB | 1 | 5 | — | MHz |
| Frequency response (RF) | f _c | λ=650 nm, 780 nm P _o =10 μW _{DC} , 4 μW _{p-p} 100 kHz reference, -3 dB | 80 | 105 | — | MHz |
| Group delay difference (A to D) | Δ G _d | 100 kHz to 50 MHz | — | 1 | 5 | ns |
| Group delay difference (RF) | Δ G _d | 100 kHz to 50 MHz | — | 1 | 5 | ns |
| Output noise level (A to D) | V _n | f=50 MHz, RBW=30 kHz | — | -87 | -82 | dBm |
| Output noise level (RF) | V _n | f=50 MHz, RBW=30 kHz | — | -76 | -71 | dBm |

Note 1) Output offset voltage: V_C is the reference for A to F, GND for RF.

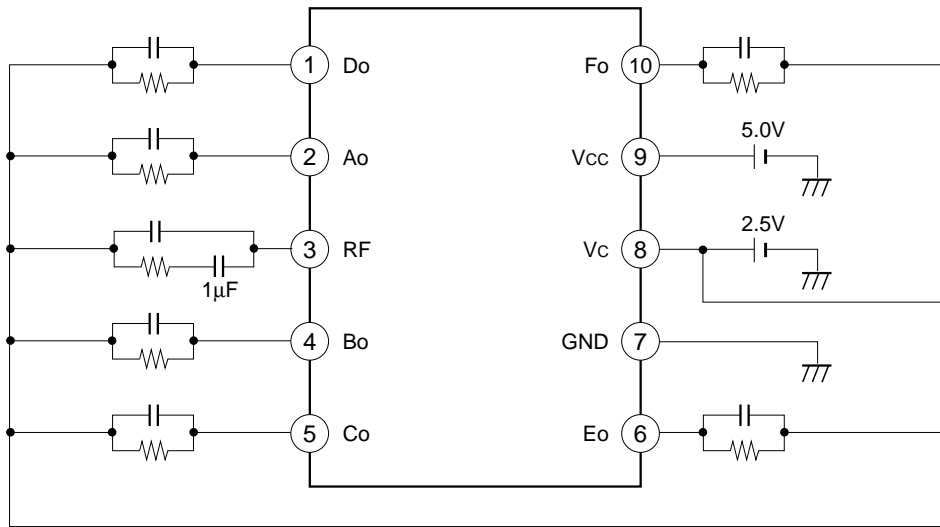
Note 2) Output voltage: V_C is the reference for A to F, GND for RF. However, the offset voltage is excluded.

Note 3) Output voltage, frequency response, group delay, output noise level: Confirmation of design.

Note 4) Measurement by the optical input: Measurement is made by emitting the light to the center of each photodiode.

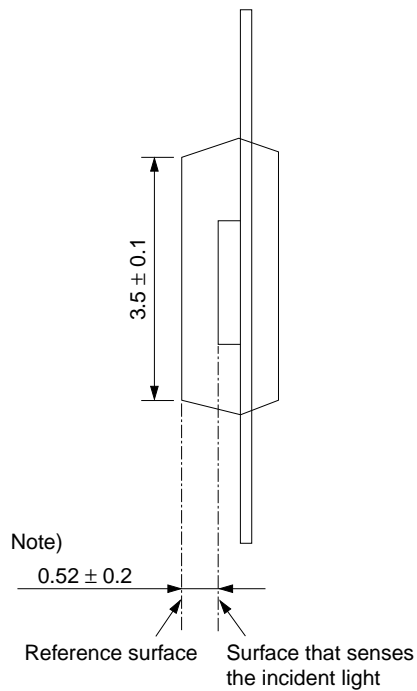
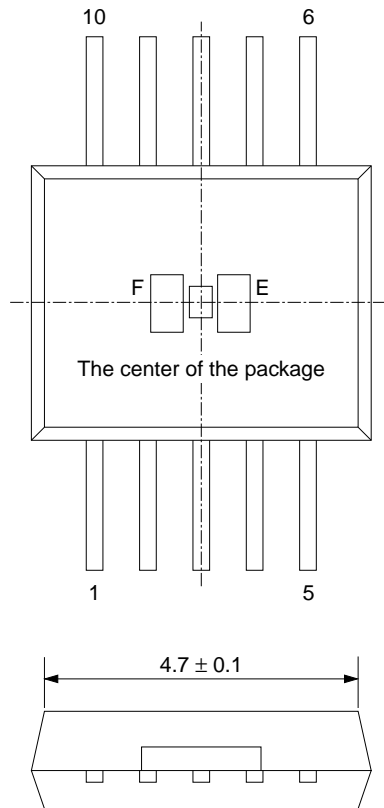
In regard of the frequency response of A to D and RF, the same response can be obtained by emitting the light to the A to D photodiodes evenly.

Measurement Circuit



* All loads are 10 kΩ//10 pF. For RF, the DC current is cut by 1 µF.

Reference Surface and Photodetector Position



Note)

0.52 ± 0.2

Reference surface Surface that senses the incident light

Note) The sink depth of the mirror surface (0.03 ± 0.02) is not included.

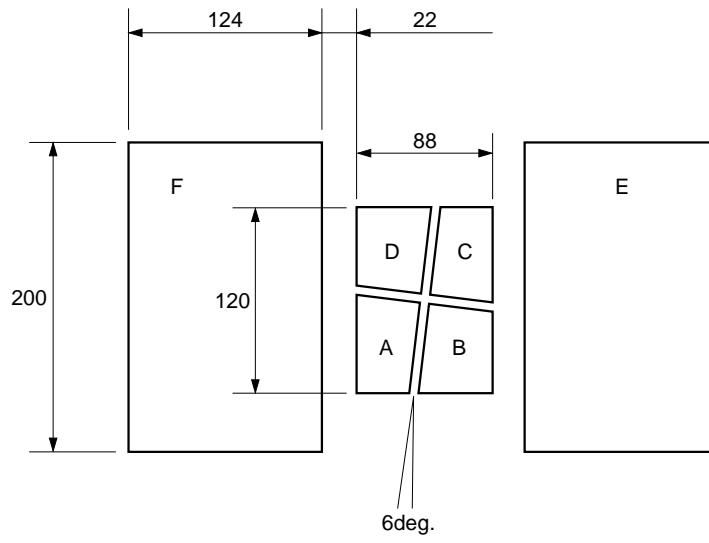
Deviation from the center of photodetector

X, Y : ± 0.2

θ : ± 2°

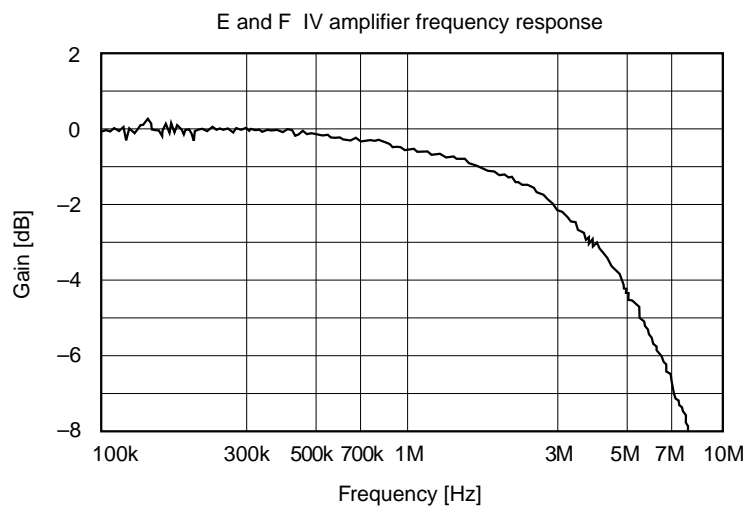
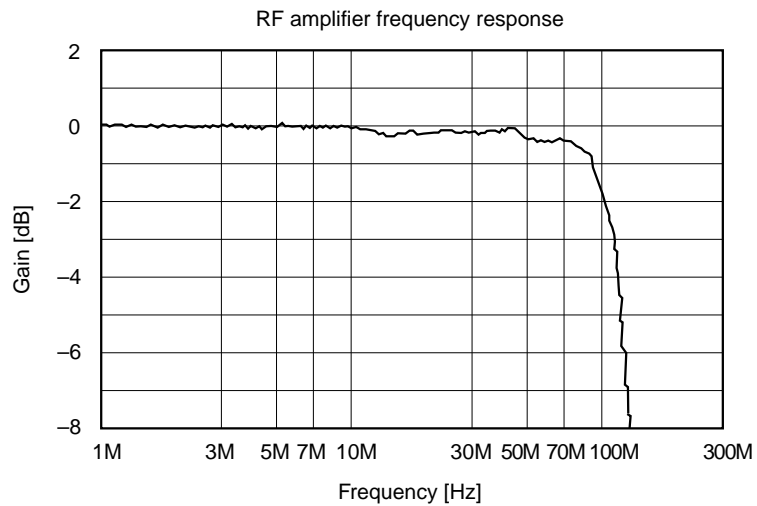
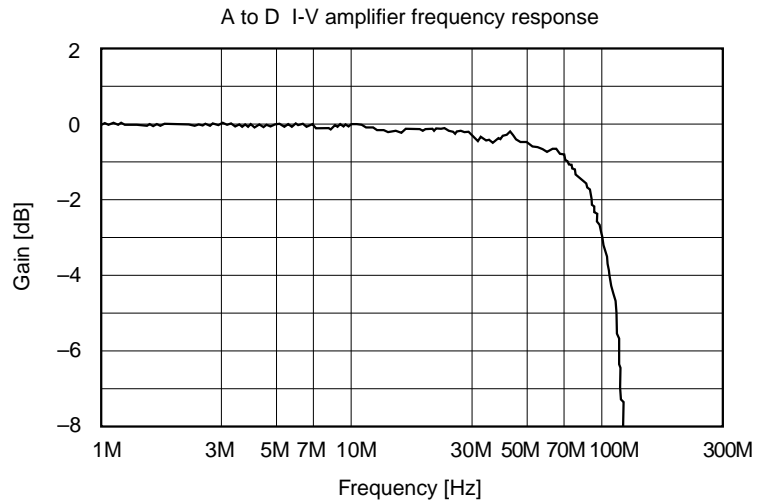
(Unit : mm)

Photodetector Pattern Dimensions



(Unit : μm)

Example of Representative Characteristics



Note on Operation

1. Power supply

The CXA2586M can be used with a single power supply or dual power supply. However, this IC is not provided with a center voltage generating circuit, and so when used with a single power supply the center voltage must be supplied from the RF amplifier or some other device.

The connection of the power supply for each case is as shown.

| | (9) Vcc | (8) Vc | (7) GND |
|---------------------|-----------------------|----------------|-----------------------|
| Dual power supply | Positive power supply | GND | Negative power supply |
| Single power supply | Positive power supply | Center voltage | GND |

The potential difference between the Vcc pin and GND should be in the range of 4.5 to 5.5 V in both of a single power supply and dual power supply.

2. Soldering

The reflow soldering is not guaranteed for the CXA2586M.

3. Mechanical strength for package

The mechanical strength for the package is not guaranteed for the CXA2586M.

Do not employ the mounting method which gives much weight to the package.

4. Visual inspection standard

Separate specifications and limit samples must be exchanged regarding visual inspection standards for the photodetector.

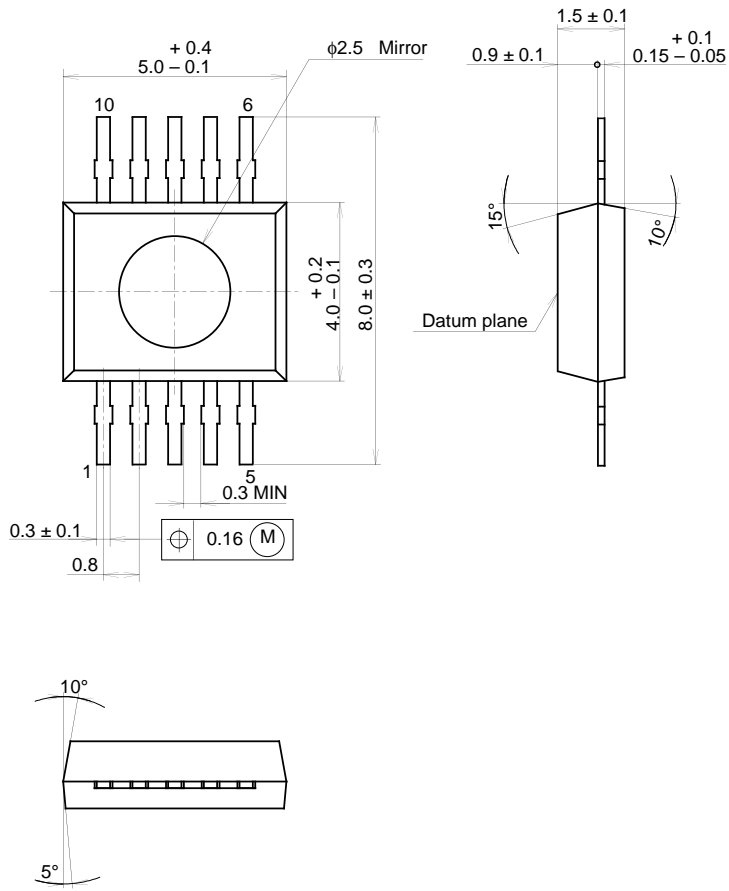
5. Bypass capacitor

The 0.1 μ F capacitor is connected between the Vcc and Vc pins, and the Vc and GND pins respectively to lower the power supply line impedance.

Take the FPC (flexible printed circuit) pattern and the like into consideration so that the bypass capacitor is located close to the PDIC.

Package Outline Unit : mm

PD-S-19-B



| | |
|------------|-----------|
| SONY CODE | PD-S-19-B |
| EIAJ CODE | _____ |
| JEDEC CODE | _____ |

| | |
|----------------|-------|
| PACKAGE WEIGHT | 0.06g |
|----------------|-------|