

I-V Photo IC for CD Player

Description

The CXA1753M is a photo IC developed as a photodetector for the optical pickup of CD players.

It has a built-in I-V amplifier, and features low output impedance for stable output.

- Focus servo : astigmatic method
- Tracking servo : three-spot method

Features

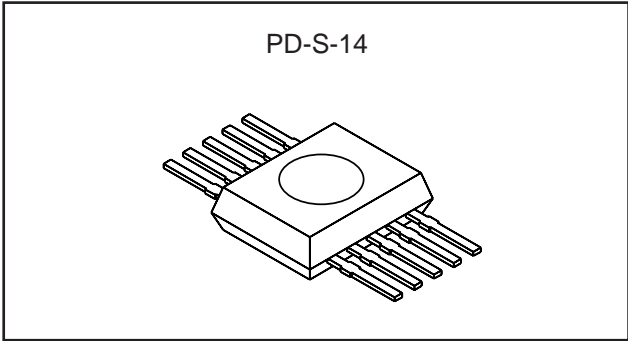
- I-V amplifier (current-voltage conversion circuit)
- Compact transparent molded package (SOP)
Identical to the shape of conventional photodiodes

Applications

Optical pickup of CD players

Structure

Bipolar silicon monolithic IC



Absolute Maximum Ratings (Ta=25 °C)

- Supply voltage V_{CC} 12 V
- Operating temperature T_{opr} -20 to +75 °C
- Storage temperature T_{stg} -40 to +85 °C
- Allowable power dissipation P_D 200 mW

Operating Conditions

- Supply voltage V_{CC} 2.8 to 11.0 V

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Electrical and Optical Characteristics I

(V_{CC}=3.0 V, V_C=1.5 V, T_a=25 °C)

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|-------------------|----------------------------------|------|------|------|------|
| Current consumption | I _{CC} | In the dark | — | 2.0 | 2.8 | mA |
| Output offset voltage (A-F) | V _{off} | In the dark | -15 | 0 | 15 | mV |
| Output offset voltage difference | ΔV _{off} | (A+B) – (C+D) In the dark | -15 | 0 | 15 | mV |
| | | (A+D) – (B+C) In the dark | -15 | 0 | 15 | mV |
| | | (A+C) – (B+D) In the dark | -15 | 0 | 15 | mV |
| | | E–F In the dark | -10 | 0 | 10 | mV |
| Output voltage (A-D) | V _O | P _O =10 μW, λ=780 nm | 290 | 370 | 450 | mV |
| Output voltage (E, F) | V _O | P _O =10 μW, λ=780 nm | 610 | 770 | 930 | mV |
| Maximum output voltage (A-D) | V _{Omax} | P _O =100 μW, λ=780 nm | 2.0 | 2.2 | — | V |
| Maximum output voltage (E, F) | V _{Omax} | P _O =100 μW, λ=780 nm | 2.5 | 2.9 | — | V |
| Frequency response (A-D) | f _c | 100 kHz reference, -3 dB | 2.0 | 3.0 | — | MHz |
| Frequency response (E, F) | f _c | 10 kHz reference, -3 dB | 100 | 400 | — | kHz |

Electrical and Optical Characteristics II

(V_{CC}=5.0 V, V_C=2.5 V, T_a=25 °C)

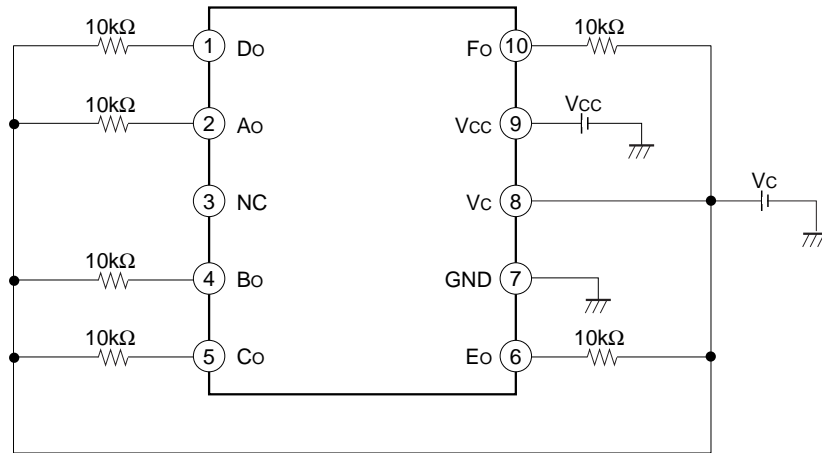
| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|-------------------|----------------------------------|------|------|------|------|
| Current consumption | I _{CC} | In the dark | — | 3.5 | 4.5 | mA |
| Output offset voltage (A-F) | V _{off} | In the dark | -15 | 0 | 15 | mV |
| Output offset voltage difference | ΔV _{off} | (A+B) – (C+D) In the dark | -15 | 0 | 15 | mV |
| | | (A+D) – (B+C) In the dark | -15 | 0 | 15 | mV |
| | | (A+C) – (B+D) In the dark | -15 | 0 | 15 | mV |
| | | E–F In the dark | -10 | 0 | 10 | mV |
| Output voltage (A-D) | V _O | P _O =10 μW, λ=780 nm | 290 | 370 | 450 | mV |
| Output voltage (E, F) | V _O | P _O =10 μW, λ=780 nm | 610 | 770 | 930 | mV |
| Maximum output voltage (A-D) | V _{Omax} | P _O =100 μW, λ=780 nm | 4.0 | 4.2 | — | V |
| Maximum output voltage (E, F) | V _{Omax} | P _O =100 μW, λ=780 nm | 4.5 | 4.9 | — | V |
| Frequency response (A-D) | f _c | 100 kHz reference, -3 dB | 2.0 | 2.5 | — | MHz |
| Frequency response (E, F) | f _c | 10 kHz reference, -3 dB | 100 | 400 | — | kHz |

Note 1 : V_C is reference for output voltage and output offset voltage.

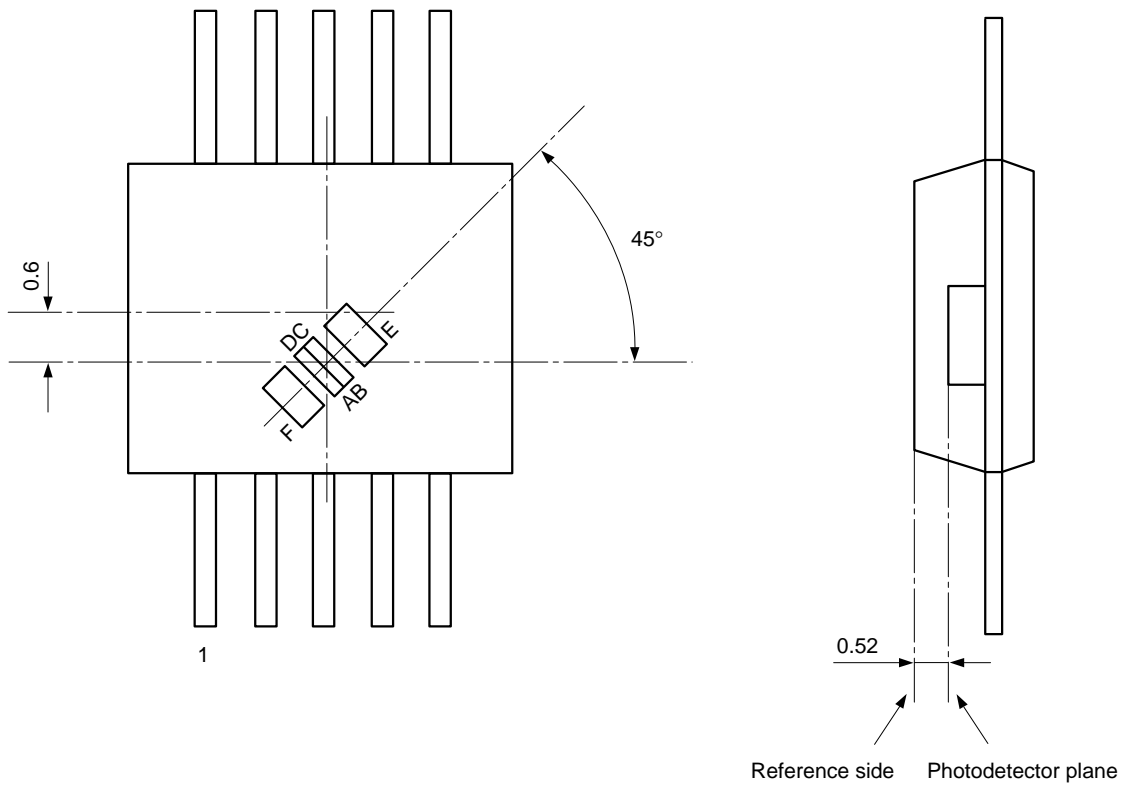
Note 2 : GND is reference for maximum output voltage.

Note 3 : Output voltage and frequency response are subject to confirmation of design.

Measurement Circuit



Photodetector position

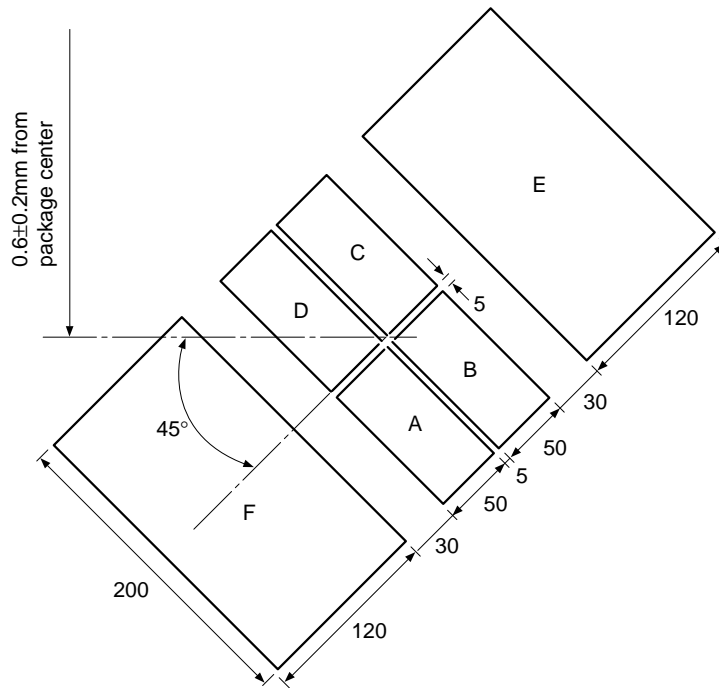


Tolerance in position of photodetector center

- X, Y : ± 0.2
- Z : ± 0.2
- θ : $\pm 2^\circ$

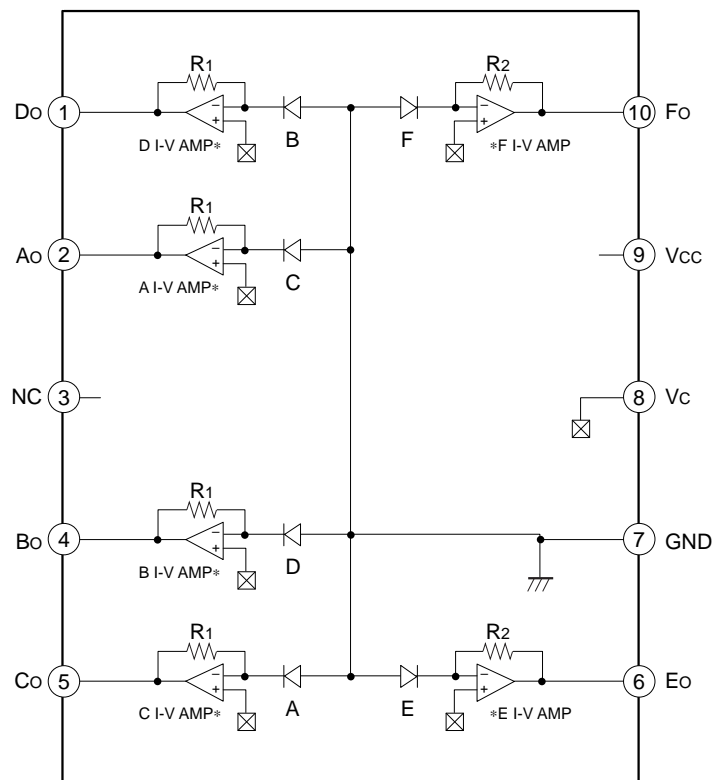
(Unit : mm)

Photodetector Pattern Dimensions



(Unit : μm)

Circuit Block Diagram



R1=166kΩ, R2=334kΩ
 A, B, C, D, E and F are photodiodes

Pin Description

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

Notes on Operation

1. Connection to RF amplifiers

The CXA1753M features the voltage-output type and the voltage-input type such as the CXA1610M should be used as RF amplifiers. The noise tolerance will be greatly improved over that of conventional photodiodes used with current-input RF amplifiers.

2. Power supply

The CXA1753M can be used either with a dual power supply or with a single 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 by an RF amplifier or some other device. For instance when the CXA1610M is used as an RF amplifier, the V_c input pin of the CXA1753M should be connected to the VR output pin of the CXA1610M.

In addition, note that Pin 3 is internally connected to Pin 7 (GND).

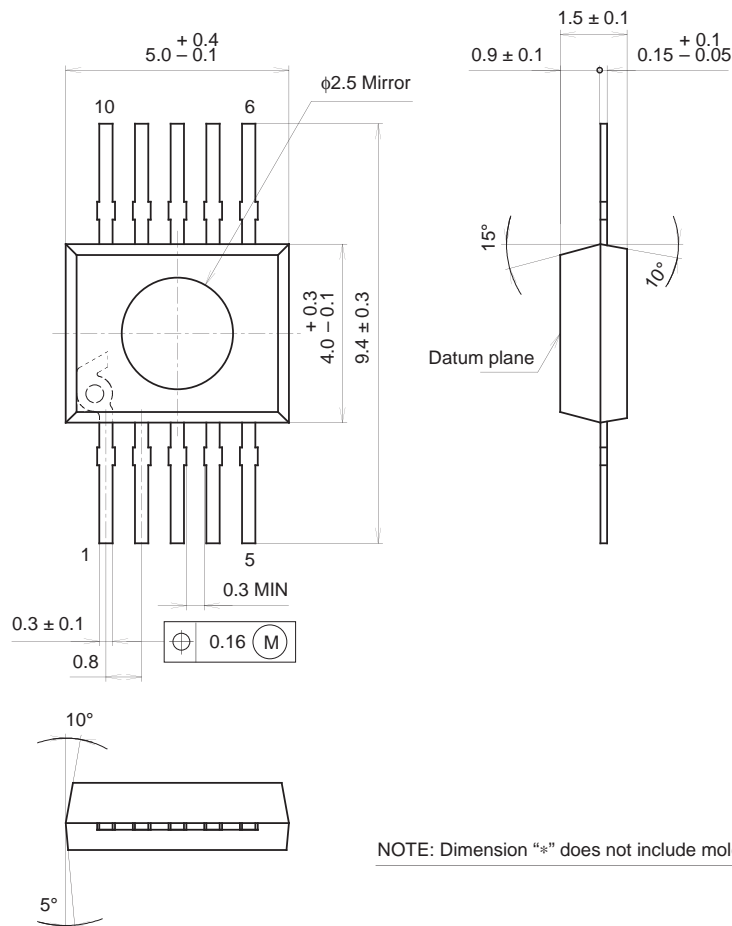
Power supply connections for each case are as follows.

| | (9) V _{CC} | (7) GND | (8) V _c | (3) NC |
|---------------------|-----------------------|-----------------------|--------------------|-------------------------------|
| Dual power supply | Positive power supply | Negative power supply | GND | Negative power supply or open |
| Single power supply | Positive power supply | GND | Center voltage | GND or open |

For both a dual power supply and a single power supply, the voltage difference between the V_{CC} and GND pins should be within the range of 2.8 V and 11.0 V.

Package Outline Unit : mm

PD-S-14



NOTE: Dimension "*" does not include mold protrusion.

| | |
|------------|---------|
| SONY CODE | PD-S-14 |
| EIAJ CODE | _____ |
| JEDEC CODE | _____ |

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