Optical Window Recommendation for LTR-501ALS

(Ver 1)

Overview

The LTR-501ALS is an integrated digital light sensor (DLS) and proximity sensor (DPS) with built-in LED driver. This sensor will require an external IR LED emitter.

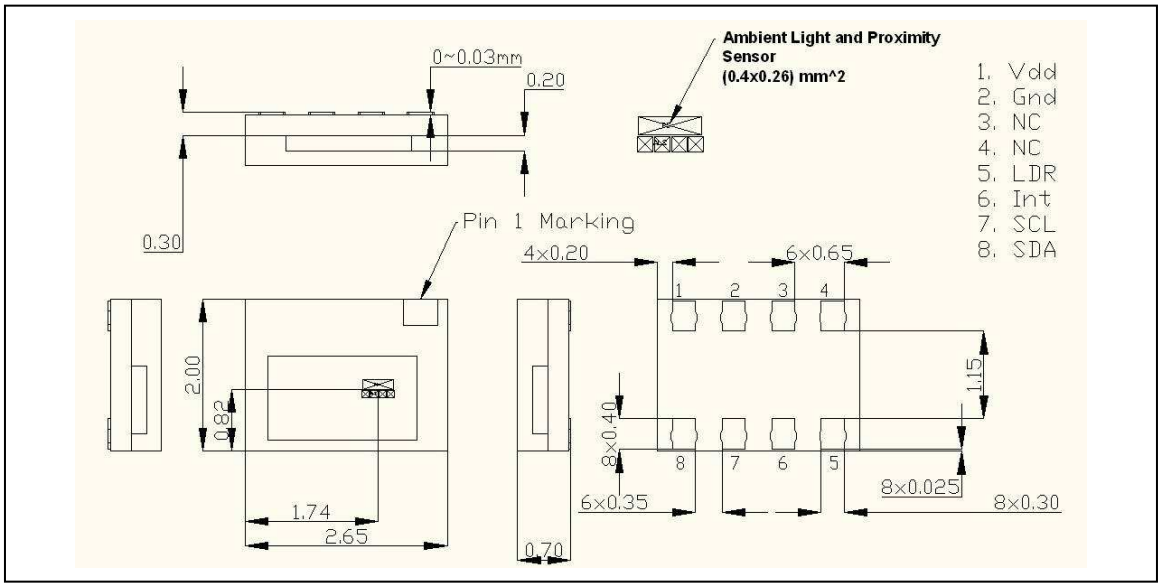


Figure1. Outline Dimension for LTR-501ALS

Recommended IR LED

The recommended IR LED to be used with LTR-501ALS is LTE-C216R-14.

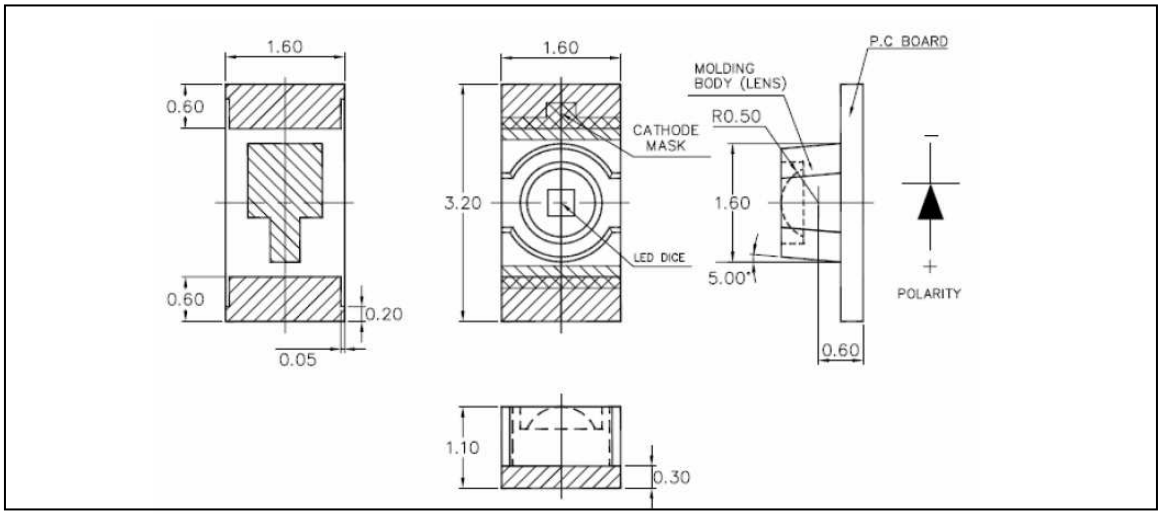


Figure2. Outline Dimension for LTE-C216R-14

Recommended Land Pattern

The recommended land pattern for LTR-501ALS and LTE-C216R-14 is illustrated in Figure3.

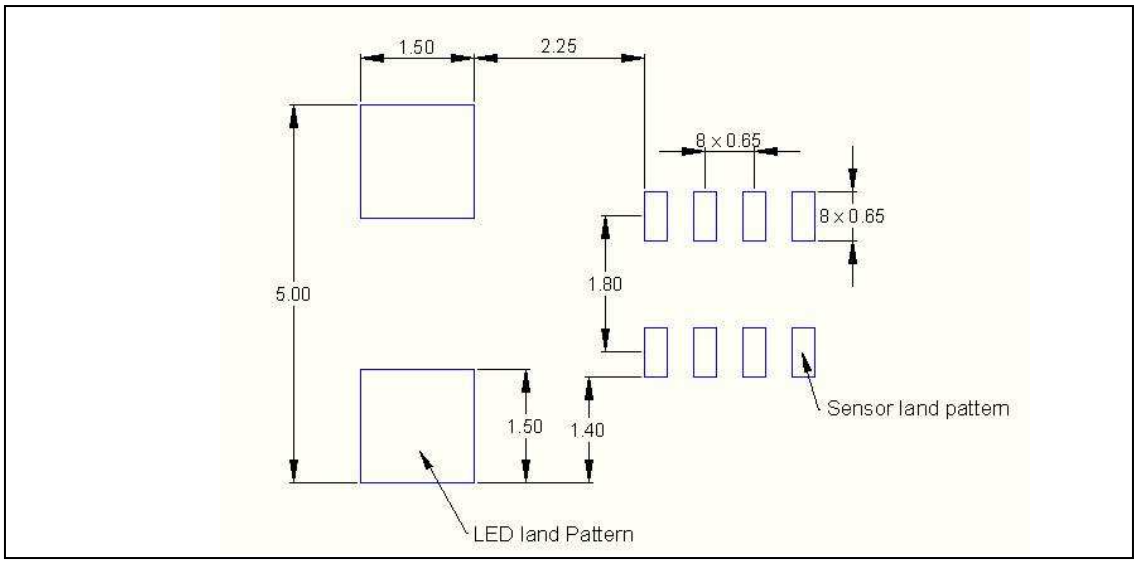


Figure3. Recommended Land Pattern

Recommended Optical Window Design

There is a constraint on the dimensions and design of the optical window that is placed in front of LTR-501ALS digital light sensor and proximity sensor. This is to ensure that the angular response and performance of the device will not be affected by improper window design.

This document provides the recommended optical window design for LTR-501ALS.

1. General

The recommended minimum window dimension will ensure the following:

- A minimum light reception cone of ±25° for the light sensor.
- Optimal detection distance range and no false detection for the proximity sensor.

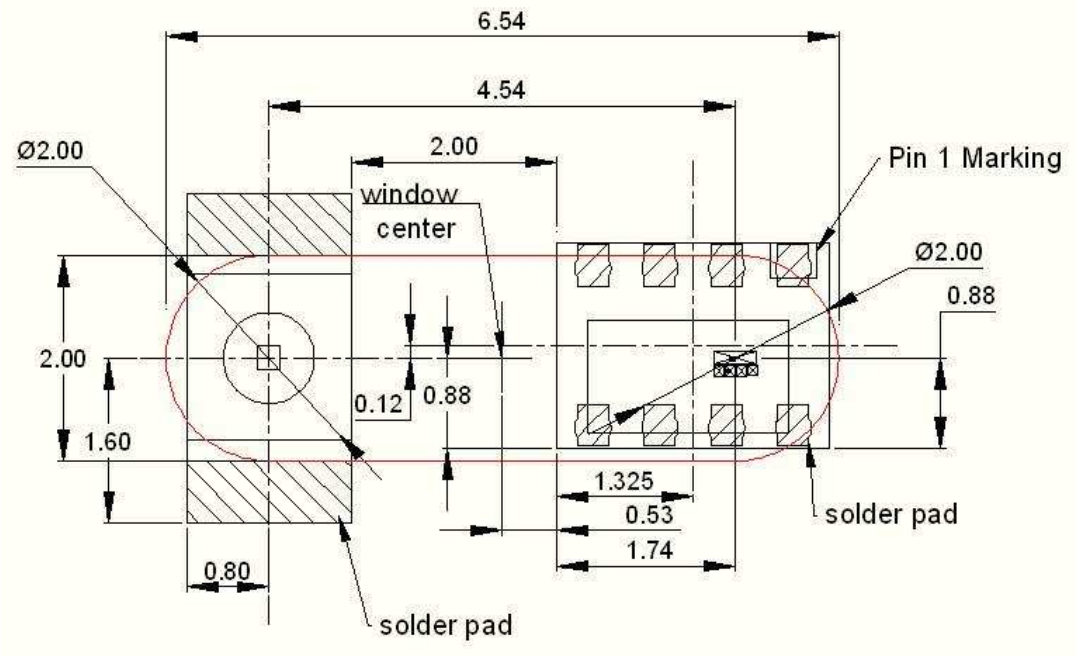
The window thickness is recommended to be ≤ 1.0 mm because every optical window will have a power loss of about 8% due to reflection (4% on each side). The plastic material will also result in an additional loss of energy.

The recommended window design can be

- One flat rectangular window
- Two flat circular windows

2. One Flat Rectangular Window

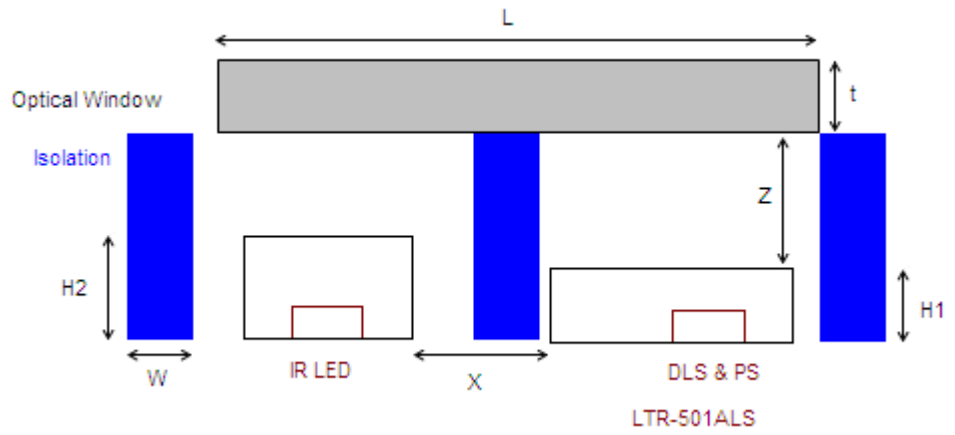
Figure4 and 5 illustrate the recommended window design for one flat rectangular window. The IR LED die is aligned to the center of the proximity sensor detector active area. Mounting center of the window with respect to the edge of LTR-501ALS is shown in Figure4.



L = length of window = 6.54 mm

Y = width of window = 2.0 mm

Figure4. Recommended Rectangular Window Dimension (Top View)



H1 = height of LTR-501ALS = 0.7 mm

H2 = height of LTE-C216R-14 IR LED = 1.1 mm

X = placement distance between edge of LTR-501ALS and IR LED = 2.0 mm

L = length of window = 6.54 mm

t = thickness of window = 1.0 mm, maximum

Z = air gap distance between rear panel of window and LTR-501ALS = 1.0 mm, maximum

W = thickness of isolation wall = 0.3 mm to 0.5 mm

Figure5. Recommended Rectangular Window Dimension (Side View)

It is recommended to consider the assembly tolerance. Dimensions X and Y are defined as:

L with assembly tolerance = L + 2*(assembly tolerance)

Y with assembly tolerance = Y + 2*(assembly tolerance)

3. Two Flat Circular Windows

Figure6 and 7 illustrate the recommended window design for two flat circular windows. The IR LED die is aligned to the center of the proximity sensor detector active area. Mounting center of the windows and the center of the emitter / detector are the same.

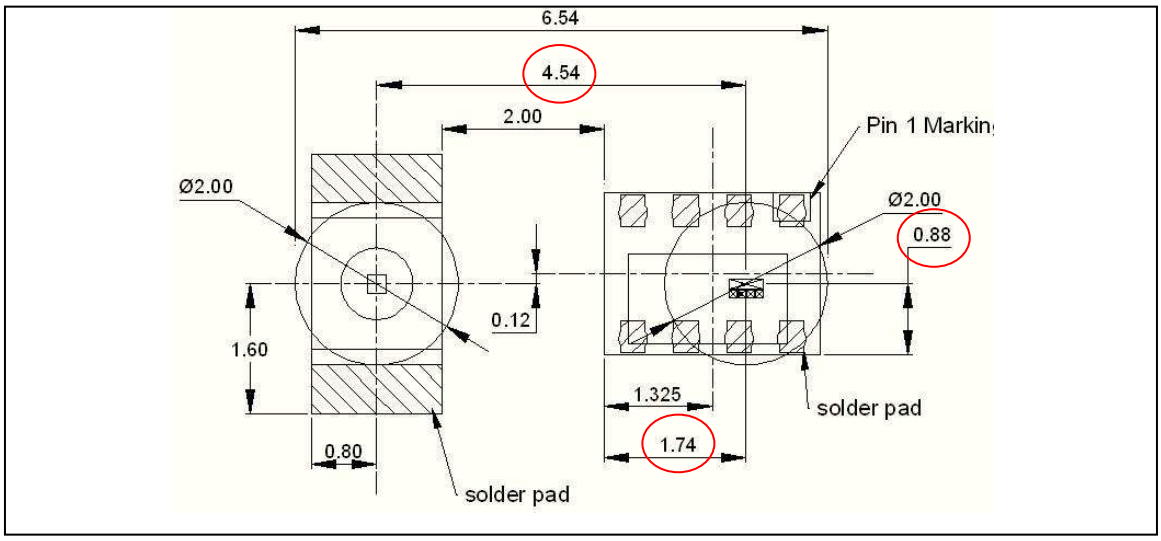
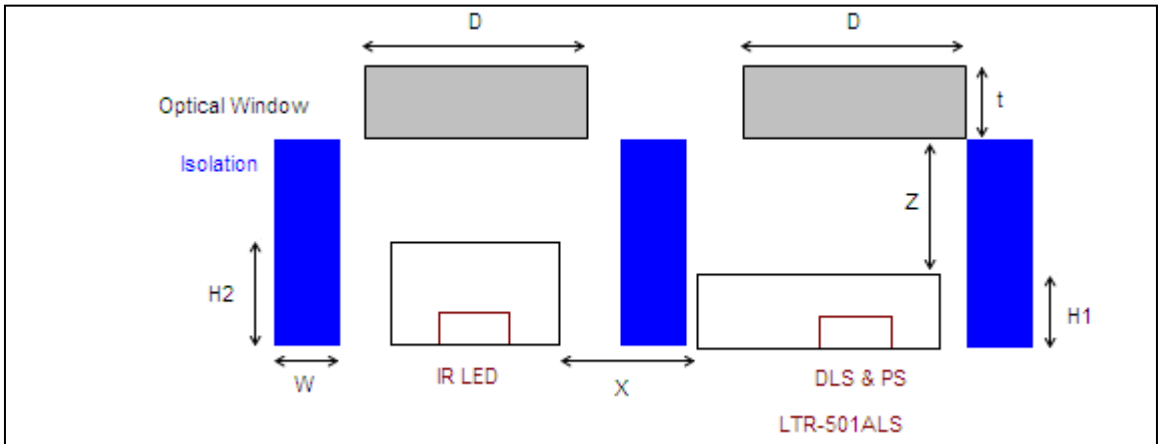


Figure6. Recommended Circular Window Dimension (Top View)



H1 = height of LTR-501ALS = 0.7 mm

H2 = height of LTE-C216R-14 IR LED = 1.1 mm

X = placement distance between edge of LTR-501ALS and IR LED = 2.0 mm

D = diameter of window = 2.0 mm

t = thickness of window = 1.0 mm, maximum

Z = air gap distance between rear panel of window and LTR-501ALS = 1.0 mm, maximum

W = thickness of isolation wall = 0.3 mm to 0.5 mm

Figure7. Recommended Circular Window Dimension (Side View)

It is recommended to consider the assembly tolerance. Dimension D is defined as:

D with assembly tolerance = D + 2*(assembly tolerance)

4. Optical Window Specifications Recommendation

- Optical window transmission percentage:

  550nm: 5%

  850nm: 60% to 80%

- Optical separator or isolation wall material:

  Rubber: ShinEtsu KE951U Silicon with twin adhesive at the bottom

  Color: Black

  Supplier: Pioneer Material Precision Tech

- Touch Panel Window material:

  Glass: Corning Gorilla

  Supplier: TPK

5. DPS Detection Distance Performance with Window Transmission Loss

The performance of DPS will be dependent on the window transmission loss. Higher window transmission loss will result in smaller detection distance.

The relationship between detection distance and window transmission for IR light is as below:

Window transmission for IR light = 100% $\Rightarrow$ Detection Distance = M

Window transmission for IR light = N% $\Rightarrow$ Detection Distance = M * N / 100