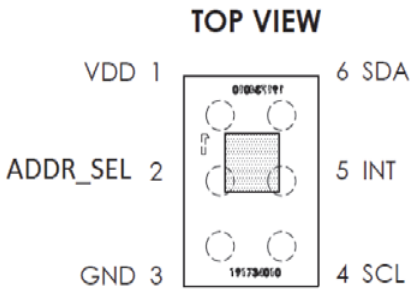
Optical Design Guide

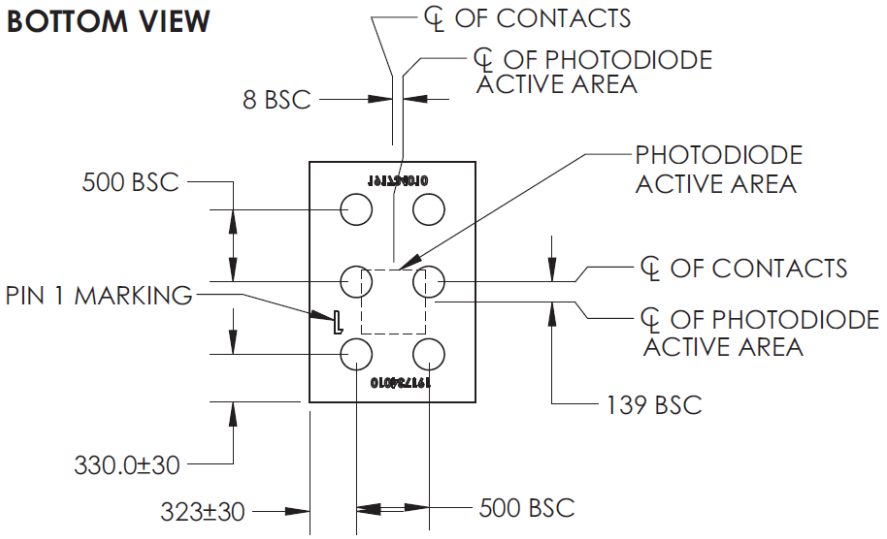
TSL2584TSV

Rev: 3

Date 3/11/2016

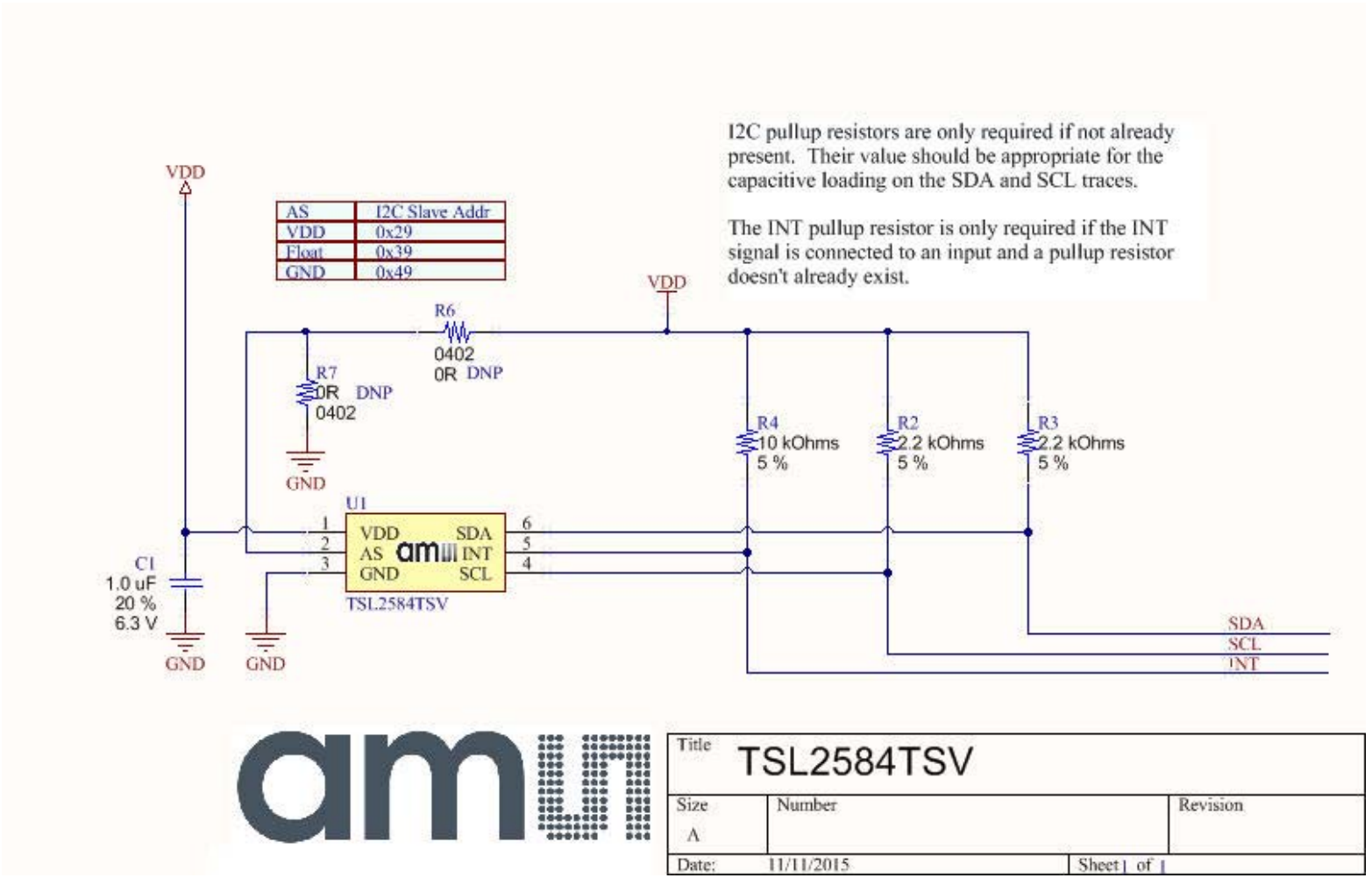
Basics of TSL2584TSV





The TSL2584TSV device provides light sensing capability in a small footprint form factor. The active photodiode area is 0.442mm square and is positioned on the die in the area shown above.

Applications Circuit



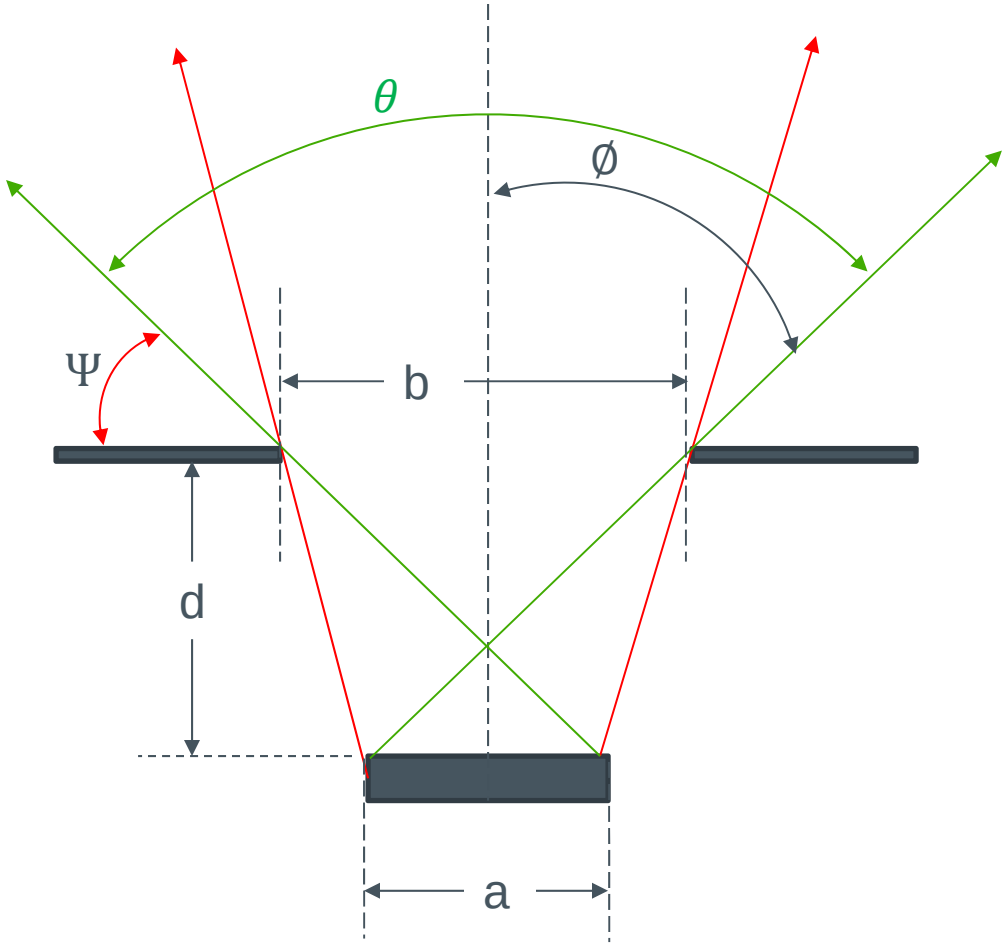
Summary

The field of view (FOV) of the TSL2584TSV is mostly controlled by the opening size in the material above the device (a.k.a. apertures in glass), and the distance from the sensor to the glass (air gap). This design guide will show the FOV for two simulated aperture sizes, and also present a mathematical expression to determine the FOV.

For a 1.0mm glass opening 0.5mm above the device the FOV is 55.26 degrees @ ½ power.

For a 1.4mm glass opening 0.5mm above the device the FOV is 61.5 degrees @ ½ power.

Quick estimate for angular response



Airgap = d
Aperture size = b
Sensor length & width = a

Field of view:

Half Power Angle:

$$\emptyset = \tan^{-1}\left(\frac{b+a}{2d}\right)$$

Full Field of View:

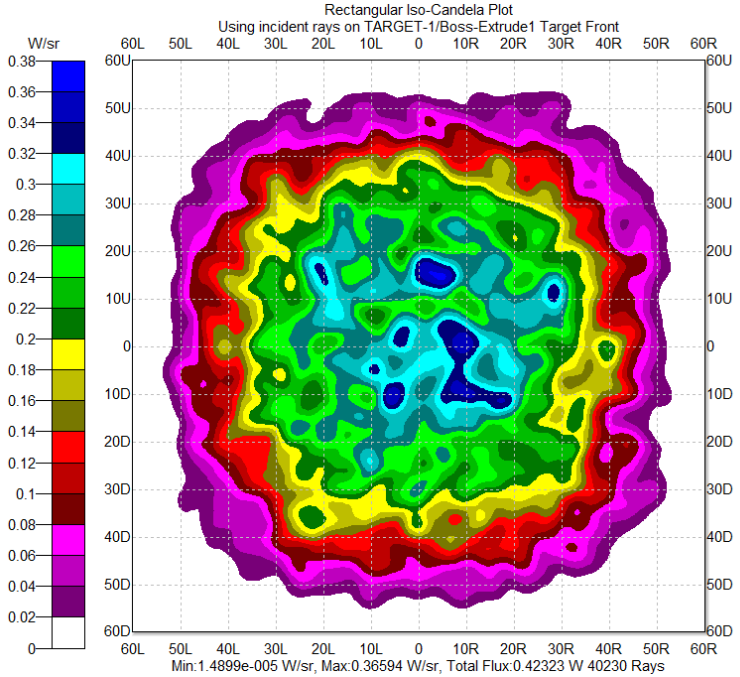
$$\theta = 2 * \emptyset$$

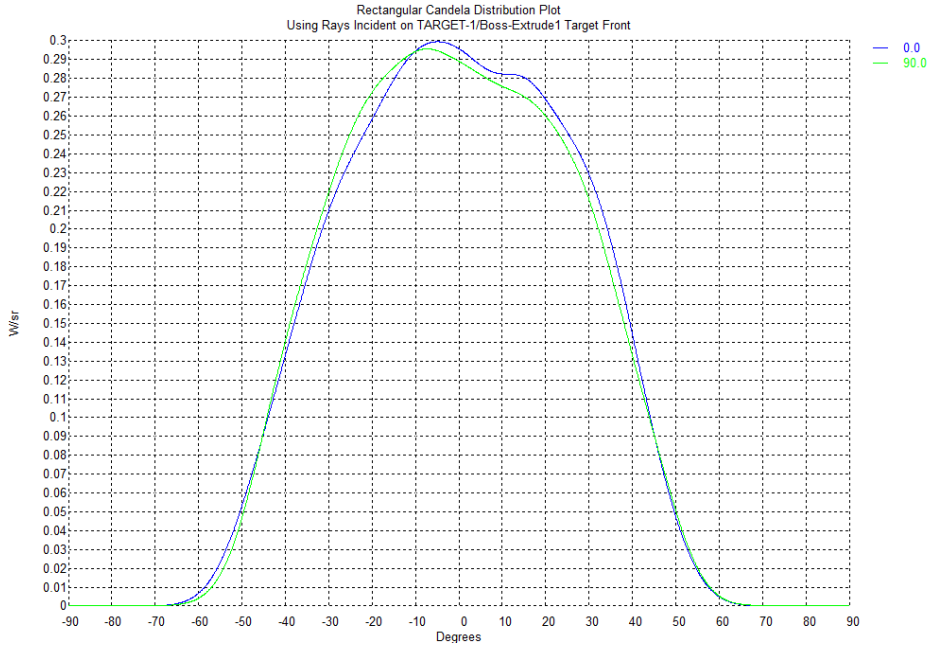
Cutoff angle:

$$\Psi = \frac{(180 - \theta)}{2}$$

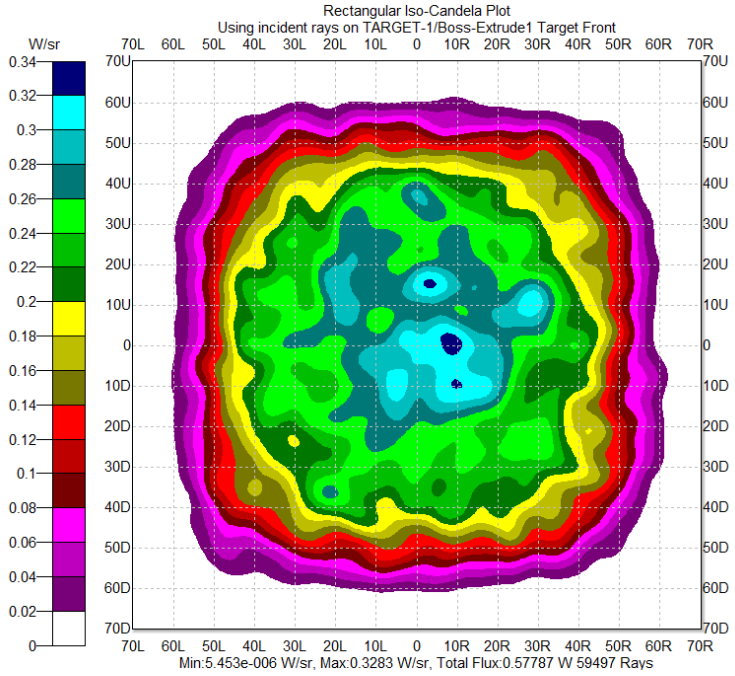
For TSL2584TSV, a=0.442mm

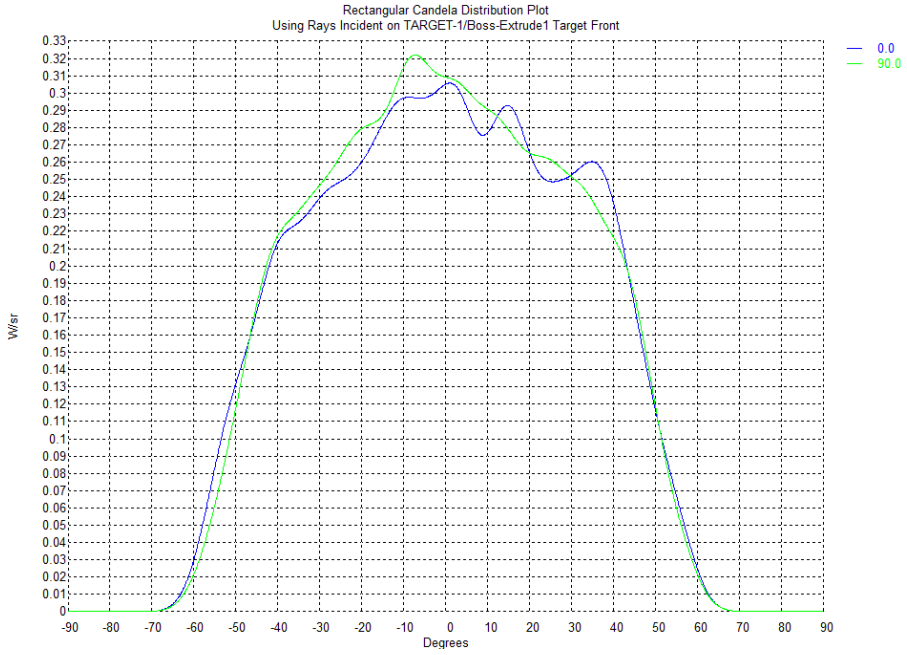
Simulation of a single circular aperture, centered over photodiode: diameter: 1.0mm, air gap: 0.5mm
The ½ power cosine corrected simulated FOV is 38 degrees.





Simulation of a single circular aperture, centered over photodiode: diameter: 1.4mm, air gap: 0.5mm
The ½ power cosine corrected simulated FOV is 47 degrees.





Conclusion

TSL2584TSV is an ambient light sensor. By itself it has a wide field of view (FOV) due to the lack of any optical barriers on the device itself.

Apertures in the protecting material covering the device determine the operating field of view (FOV) in an application. The size of the opening and the distance from the protecting material to the surface of the photodiode determine the FOV. A mathematical formula for the resulting FOV is shown in this document.

The thickness of the protecting material is not critical, although generally values between 0.45mm and 1.2mm are used.

Thank you

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