

am^{LED} AS5952M

Datasheet

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AS5952 Sensor chip for 64-slice CT detector

1 General description

The AS5952 is a sensor chip for 64-slice CT detectors that combines the photodiodes and the readout circuit on a single CMOS chip. This sensor solution, which includes an array of 32 x 8 photodiodes with ultra-low dark current and a 256-channel ADC side-by-side, allows the assembly of the pixel array on three adjacent edges of the device. Two AS5952 ICs can be placed in Z-direction enabling the design of CT detectors with 40 mm of Z-coverage in ISO center.

The AS5952 has a sensor dimension in Z-direction of 36.125 mm with a pixel dimension of 1.130 x 1.002 mm². Pixel dimensions can be customized on request. The sensor can be directly assembled on a substrate using a wire bonding process for manufacturing of a CT module.

Improved low dose performance can be achieved because of superior dark current of max. 1 pA due to the near zero offset voltage across the photodiode. The input-related noise is very low, a max. noise level of 0.36 fC can be reached including photodiode for an input current range of 200 nA.

The max. power dissipation of 1.46 mW per channel in normal mode and 1.23 mW per channel in low power mode reduces self-heating effects and lowers the overall cost of cooling the system. An internal reference voltage and bias generator reduces the bill of material. Featuring on-chip photodiodes, the AS5952 offers a cost-optimized solution for 64-slice CT detectors.

The digital data readout can be accessed via a 55 MHz LVDS interface. A SPI interface is used for device configuration such as mode of operation, input current range, selection of reference voltage and enabling the calibration mode. An integrated temperature sensor enables monitoring of the junction temperature. The AS5952 is delivered as die on foil on frame.

1.1 Key benefits & features

The benefits and features of AS5952, sensor chip for 64-slice CT detector, are listed below:

Table 1: Added value of using AS5952

Benefits	Features
Ultra-low dark current of max. 1 pA	Automatic zero offset voltage calibration across photodiode for ultra-low dark current
Lowest input related noise of max. 0.36 fC at 200 nA input range	Monolithic integration of 256-channel ADC and photodiode array in one sensor
Fast integration time of min. 80 μ s	Integrated reference voltage and bias current generator for low bill of material
Low power dissipation of 1.23 mW/Ch at 200 μ s and 1.46 mW/Ch at 80 μ s	Two power modes for min. integration time of 80 μ s and 200 μ s
High ADC linearity of \pm 600 ppm including photodiode	Calibration mode for external linearity calibration
55 MHz LVDS interface for data streaming	Customization of pixel dimensions on request

1.2 Applications

- Medical, industrial and security CT detector modules
- 32 and 64-slice CT detectors

1.3 Block diagram and module solution

The functional blocks of AS5952 are shown below:

Figure 1: Block diagram

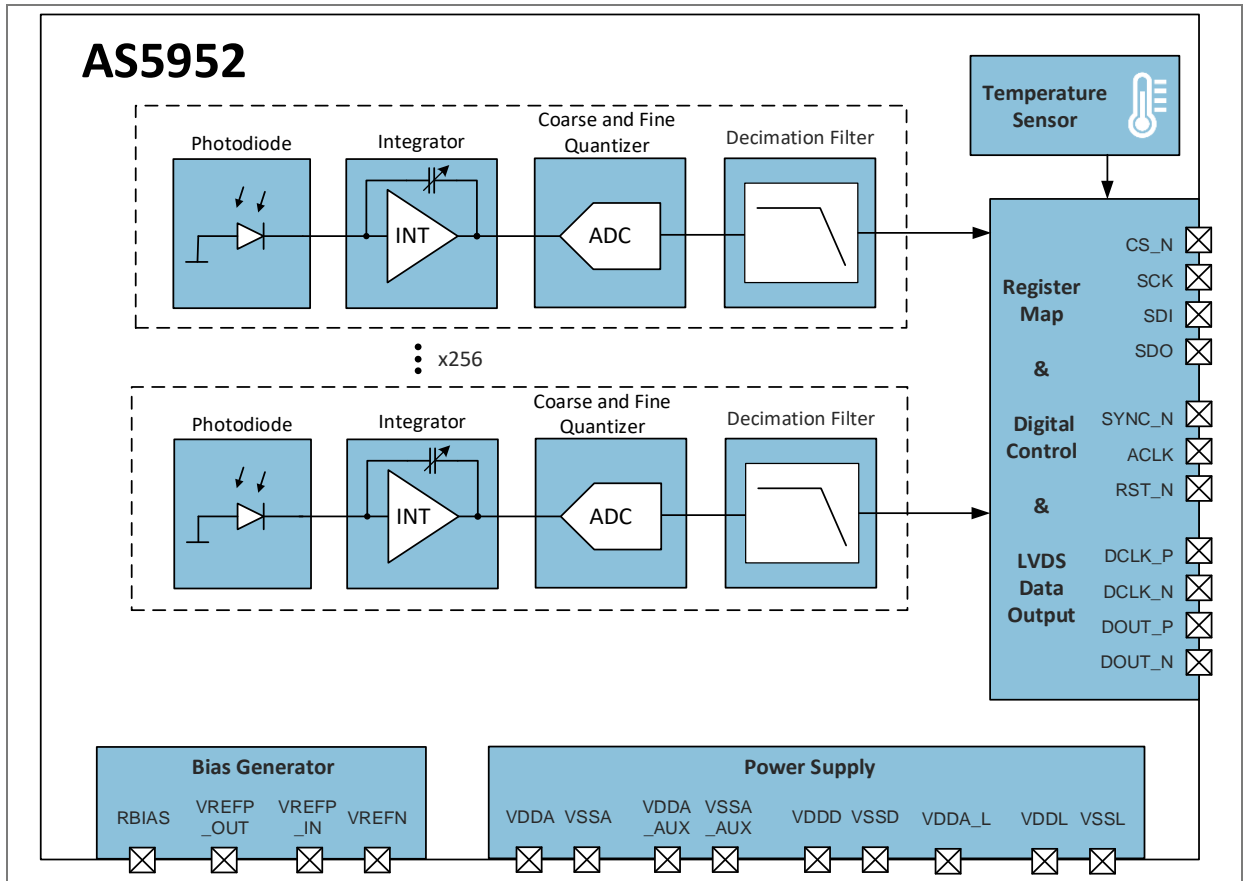
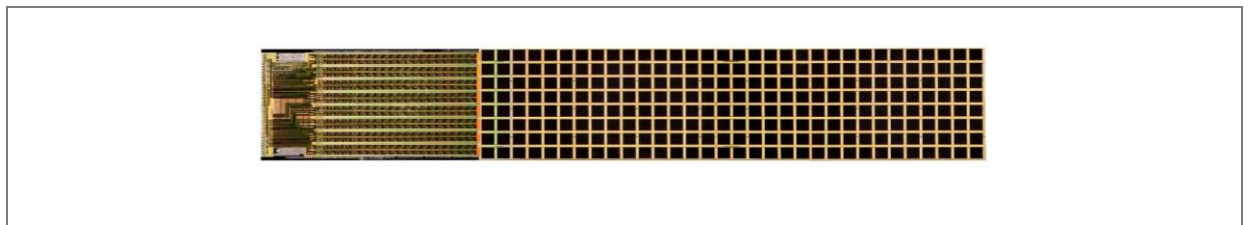


Figure 2: AS5952 – top view of sensor chip



2 AS5952M module

The AS5952 is designed to be assembled on a substrate for a CT module. The device layout is done in such a way that ADC and bond pads are placed on the outside of the die. Standard wire bond technology can be used to connect the pads of the AS5952 to the substrate. Between the ADC and the photo diode array is a gap of 250 μm without active circuitry. X-ray exposure of that area is therefore acceptable and no shielding in this gap is required. The other areas of the die should be shielded against X-ray either by the scintillator or some shielding materials. Photodiodes are shielded by the scintillator assembled on top. The ADC requires some additional shielding e.g. with tungsten in order to avoid performance drift due to the X-ray exposure.

The AS5952M module consists of 1x3 AS5952 integrated circuits that are mounted onto a PCB substrate and connected with wire bonding protected by a glob top. The interface is on the bottom side through a Hirose FH40-50S-0.5SV connector that accepts a standard 0.3 mm thick Flexible Printed Circuit (FPC) and is located on the back side of the module. All required, passive SMD components are mounted on the back side of the substrate as well.

2.1 Block diagram and module solution

The functional blocks of AS5952M module are shown below:

Figure 3: Block diagram of AS5952M module

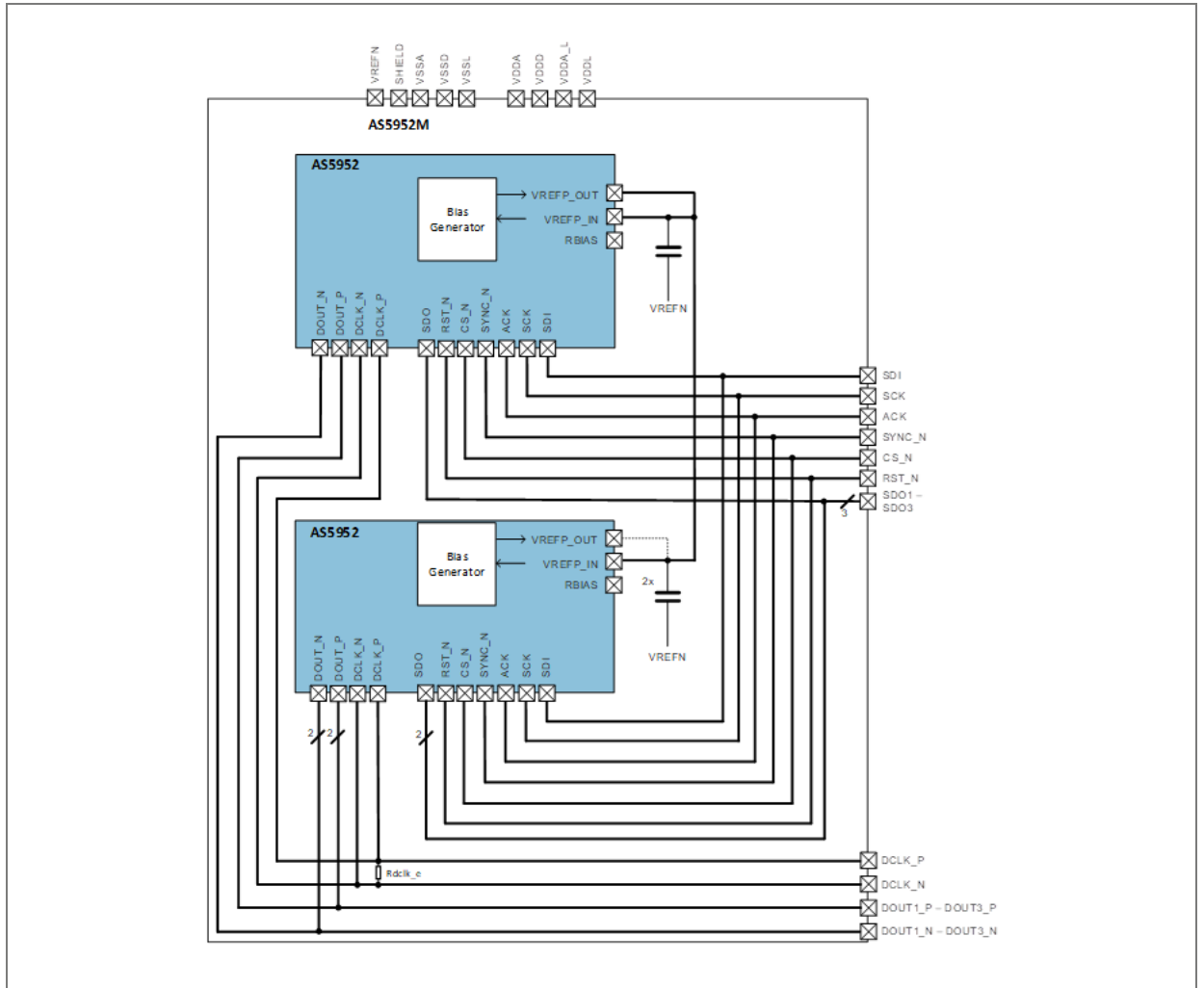


Figure 4: AS5952M – top view of module

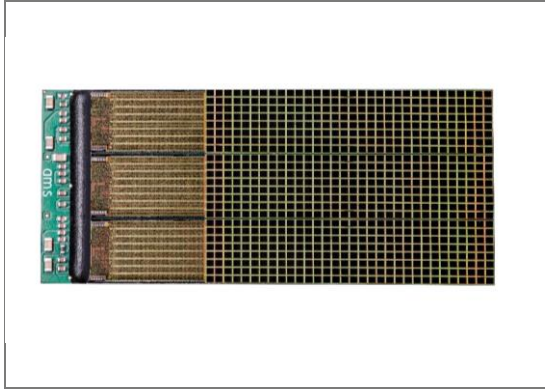
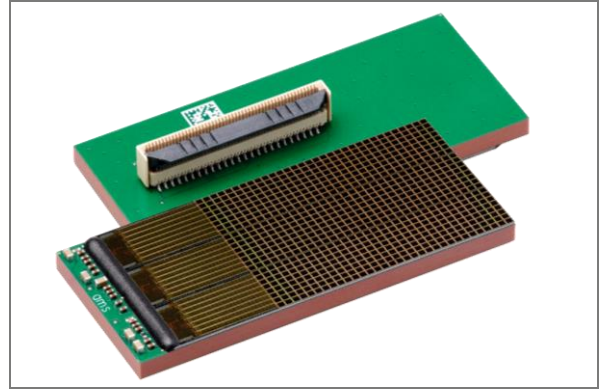


Figure 5: AS5952M – stacked view of module



3 Ordering information

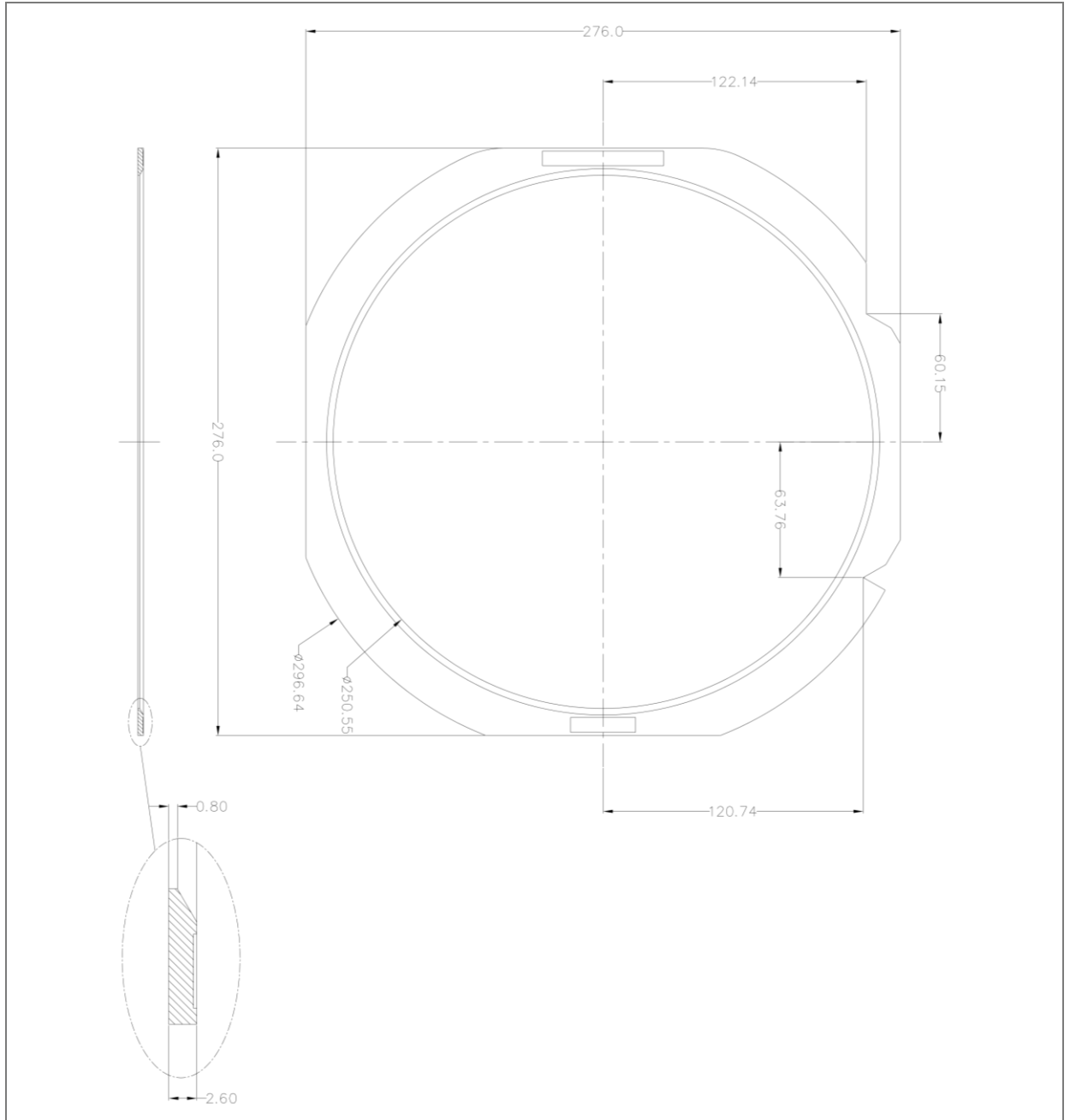
Ordering code	Package	Delivery form
AS5952-SD-F	Bare die	Wafer / Die on foil
AS5952M_Lv2	Module without scintillator	8pcs / Tray

(1) Pixel dimensions can be customized on request. Please contact ams OSRAM for more information.

3.1 Delivery form of AS5952

The AS5952 devices are delivered sawn on foil and frame. The dimensions of the frame are shown in the Figure 6.

Figure 6: Frame dimensions⁽¹⁾

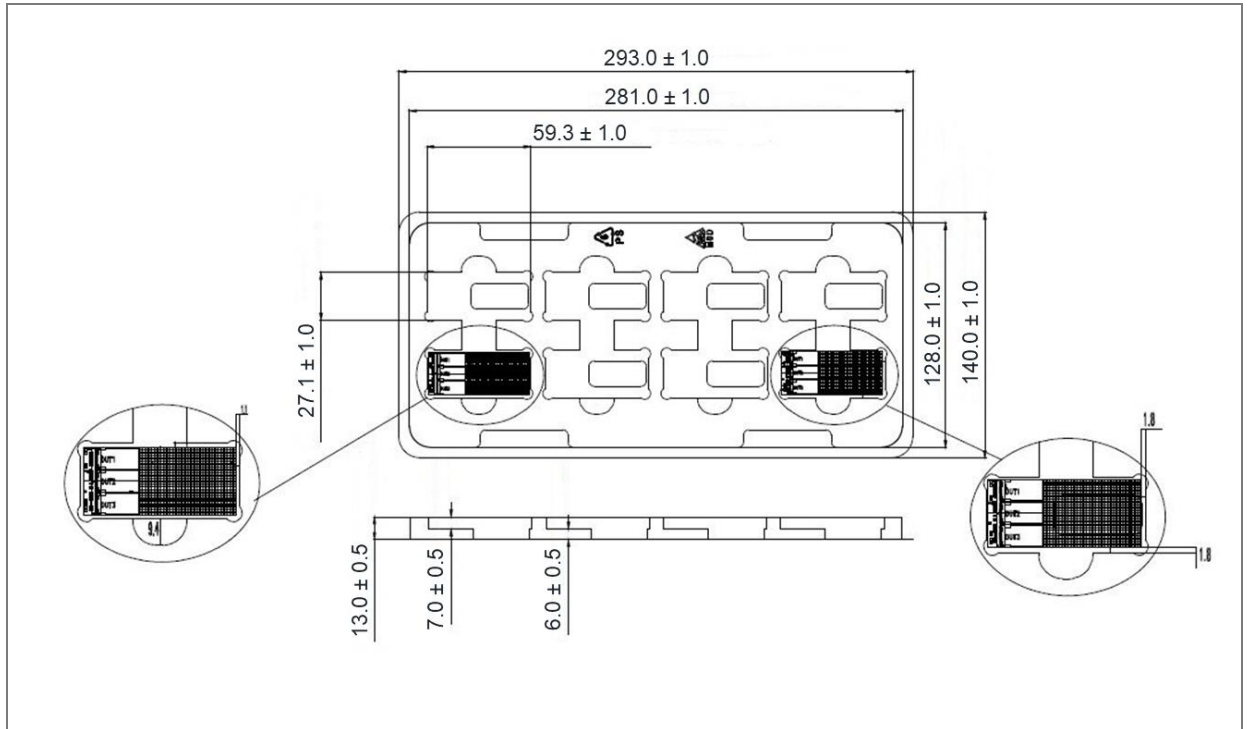


(1) All dimensions are in millimeters.

3.2 Delivery form of AS5952M module

The AS5952M modules are delivered in tray. The dimensions of the tray are shown in the Figure 7. Each tray can contain eight AS5952M modules.

Figure 7: Tray dimension⁽¹⁾



(1) All dimensions are in millimeters.

4 Revision information

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Product Preview	Pre-development	Information in this datasheet is based on product ideas in the planning phase of development. All specifications are design goals without any warranty and are subject to change without notice
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Changes from previous version to current revision v1-00

Page

This short datasheet is derived from v1-00 of full datasheet

- Page and figure numbers for the previous version may differ from page and figure numbers in the current revision.
- Correction of typographical errors is not explicitly mentioned.

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